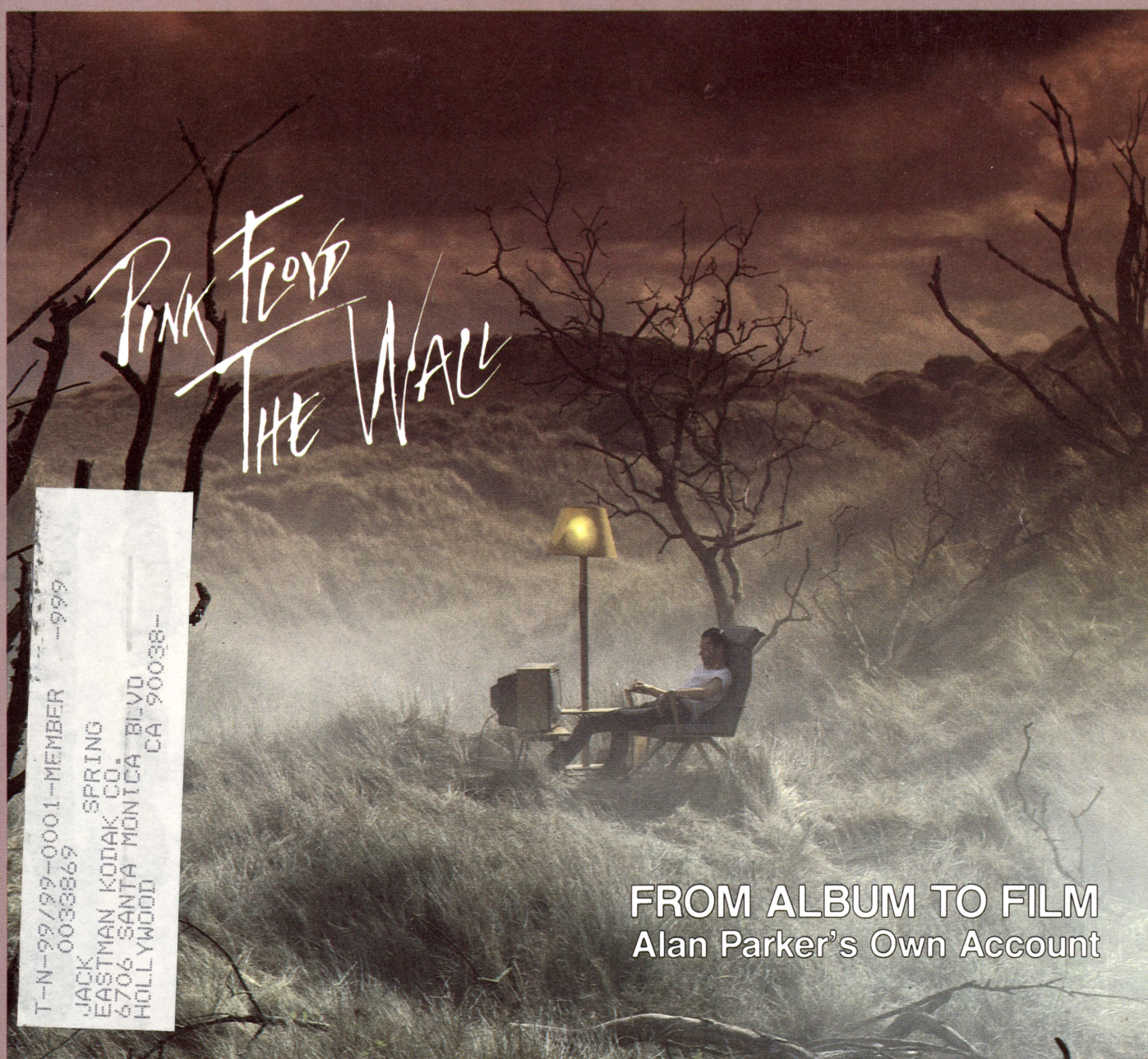


American Cinematographer

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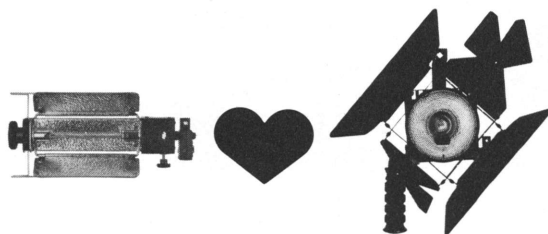
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ON THE COVER

Bob Geldof as Pink watches television in an alien landscape created by production designer Brian Morris and cinematographer Peter Biziou for PINK FLOYD THE WALL. The film adapted from the album was written by Roger Waters, designed by Gerald Scarfe, produced by Alan Marshall and directed by Alan Parker, Photo by David Appleby.

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FROM THE EDITOR

A recent visit to a set renewed my appreciation for a production technique which is rarely if ever discussed in our articles—the technique of invisibility. There are some films which come out best if the crew is virtually invisible during the shooting. I am not thinking simply of candid camera documentaries, but rather of films which require sustained and intense performances from the actors. I took some acting classes once, and I immediately discovered that acting not only requires an incredible amount of concentration but also involves an extreme degree of emotional vulnerability. Because most “professional” actors have developed techniques for coping with the necessities of film and television production, it is easy for a crew to be oblivious of what an actor may be going through. In many productions it is only the “crying” scenes or the nude scenes which require special consideration from the crew, but with great acting every scene is a nude scene. The actor is letting go and exposing himself emotionally, and it is not easier to do so in front of a group of people who may seem completely insensitive to the actor’s state of mind.

It is easy to assume that the need for a dressing room or trailer for an actor is simply a matter of pandering to a star’s ego, but the fact of the matter is that an actor can not hope to achieve the level of concentration required by serious acting unless he has some way of isolating himself from the hubbub of preparing to shoot on a set. Just because some actors on some movies can joke around with the crew between takes, one should not dismiss, as a sign of unfriendliness, the need for other actors to isolate themselves from the crew.

There is a tremendous difference between giving a performance and simply saying your lines and hitting your marks. What enables an actor to achieve that difference is not only talent but also a working atmosphere which is conducive to acting, and it is

the crew which creates or destroys this atmosphere. Even a visitor to a set quickly learns to stay out of an actor’s line of sight during a scene so as not to distract him, but between takes a crew member with a job to do may assume that it is more important to communicate his needs quickly by shouting than it is to maintain an atmosphere of hushed reverence out of deference to the star. Obviously there is a middle ground, and a good crew is one that can communicate both quietly and quickly. In fact some crews develop an ability to communicate almost non-verbally, and the availability of sophisticated electronic communications systems has made feasible the use of headsets to improve communications among a film crew.

One of the advantages of the new high speed Kodak negative which may not be immediately obvious is that lighting sets to lower light levels makes it easier for an actor to relate to them as real environments. It is now sometimes hard to tell if a set is lit or not. On the other hand using the higher speed to increase the depth of field may free an actor from having to hit precise marks in order to be in focus and enable him to concentrate more on his performance. It all depends on the actor and the film; and, although the actors’ needs are not the primary consideration in lighting a set, in many instances they may be important.

There are also ways in which the scheduling of the shooting can make it easier or harder for an actor to do his job. As in all areas of film production there are compromises necessary between creative needs and practical or financial considerations. There is also the psychology of the crew to consider. It is not as much fun to be invisible as it is to walk and talk like normal human beings. If a director expects his crew to be invisible, he had better be making a picture that everyone can be proud of.

—RICHARD PATTERSON

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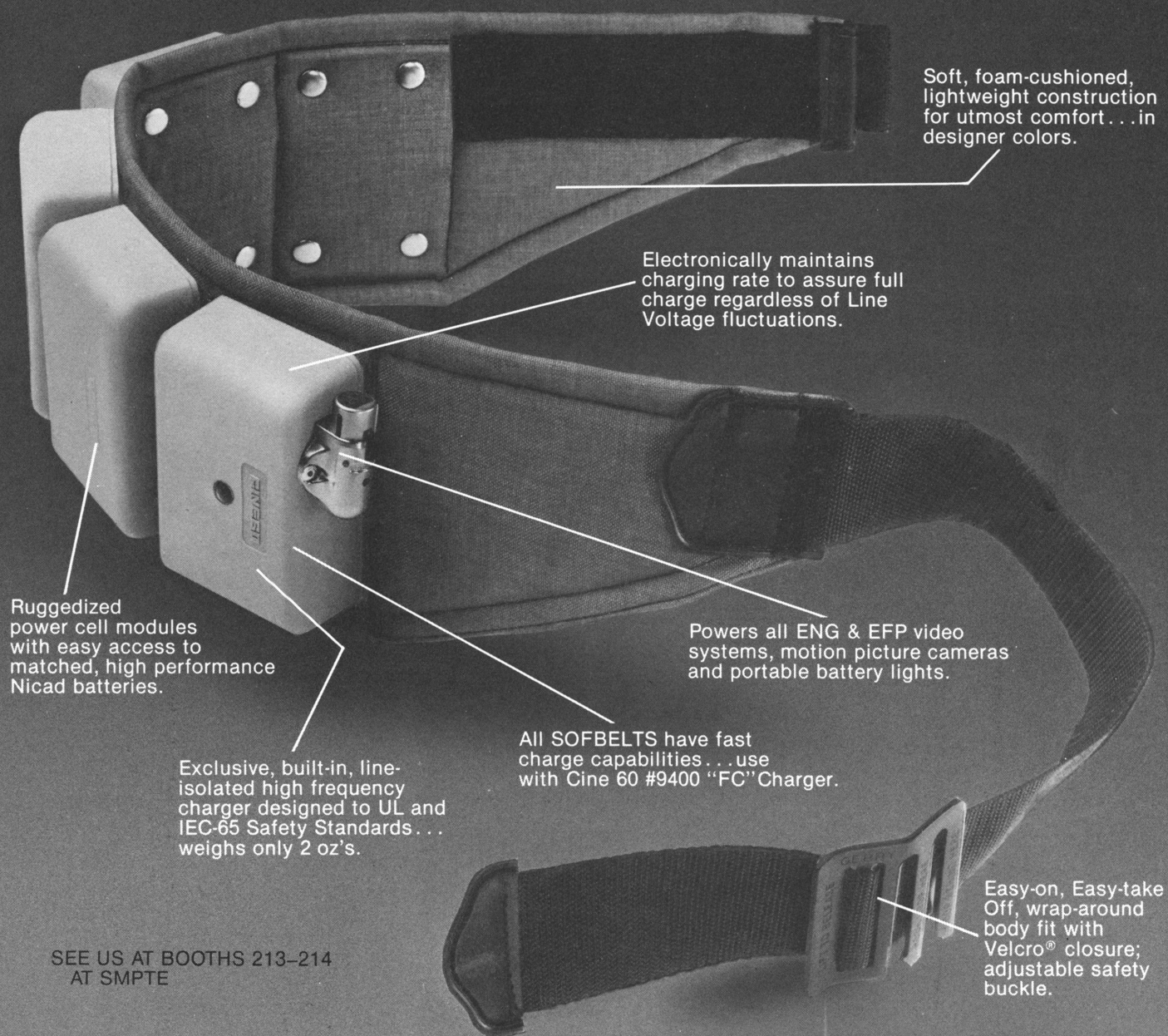
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LETTERS

Getting the Blues

Help! I have recently been trying to come up with a blue screen through various methods including mixing paints but have had no luck. Is there a supplier who would have it already in the can? If not have there been any past articles in your journal pertaining to blue screen?

Any assistance you can provide will be greatly appreciated.

Tim Tyler
Tulsa, Oklahoma

Pat Smith of the Ultimatte Corporation says they recommend Mann Brothers Ultramarine Blue #85-980, a water base paint manufactured by Mann Brothers, 757 N. La Brea Avenue, Hollywood, CA 90038. She doubts that you can find it in Tulsa, but the Ultimatte Corporation handles out of state orders for Mann Brothers. She can ship it to you C.O.D. via U.P.S. at \$19.50 a gallon. Contact her at (213) 345-5525 or write to Ultimatte Corporation, 18607 Topham Street, Reseda, CA 91335. Ultimatte also sells an oil base fluorescent green paint called Ultimatte Green which is manufactured specifically for matting with green backgrounds. (See the article on Ultimatte in this issue.)

In his article on Blue Screen in the American Cinematographer manual Joseph Westheimer, A.S.C., recommends the use of the Stewart T-Matte Blue Screen, a translucent blue material designed to be illuminated from the rear. See also Petro Vlahos article on Traveling Matte Composite Photography in the manual.

Debate Goes On

Since the introduction of videotape over twenty-five years ago, many have forecast the demise of film as a recording medium. The recent development of high-definition television (HDTV) adds considerable substance to such predictions, perhaps not so much in itself, but as just a hint of things to come. I am leery, though, of video as a motion picture imaging medium. It has a long, long way to go before it can seriously compete with film in that capacity.

First, a resolution of 1125 lines is better than one of 525, but is still inadequate. Even if ECN II 5247 resolved only 100 lines/mm, a 35mm frame with a 1.85:1 aspect ratio measuring 20.96 x 11.34mm would resolve 2,376,864 picture elements, more than twice the number in an HDTV picture. In reality, 5247 resolves much more than 100 lines/mm;

thus, if video were seriously to compete, it would need a resolution possibly as high as 4000 x 3000.

Second, the video camera would need a light sensitivity equivalent to at least ASA 250, and the gain should be increasable by 12dB—about two stops—without marked image noise.

Third, the brightness range should rival that of film—about eight stops.

Fourth, video image problems—lag, tailing, burn-in, etc.—must be totally eliminated.

Fifth, frame rates from time-lapse single frame to, say, 200 or 300 fps must be possible, with no loss of resolution. The 24 fps cine rate—and, indeed, all rates below 30 fps—must be free of strobing.

Sixth, the camera must be no larger or heavier than the Panaflex, and the recorder should be smaller and lighter than current one-inch machines.

These requirements are, of course, debatable, but one thing is not: for it to supplant film in theatrical filmmaking, tape must suffer nothing in comparison.

Lawrence P. Bansbach
Philadelphia, PA

Variable Shutters

I have two questions concerning the variable shutter: 1) What are the advantages and disadvantages of the variable shutter? 2) Does closing a variable shutter affect registration?

Joseph Isaac
Baltimore, MD

Ed DiGiulio, president of Cinema Products, says that the principal advantage of a variable shutter is that it permits the cameraman to maintain the correct exposure without altering the depth of field when moving from one lighting situation to another. The same results can of course be obtained through the use of neutral density filters. A second use of a variable shutter is to prevent bars when photographing a television screen (set at 144°) or to prevent flicker when shooting with HMI lights (set at 172.8° for 24 fps with 60Hz current to lights). In the old days cameras with variable shutters which could be adjusted while the camera was running were used for doing effects in camera.

A variable shutter will not affect registration at all. What it can affect is the apparent smoothness of motion. If a shutter is closed down to 45° or less, objects moving fast enough to blur with a normal shutter may be sharp enough to create a strobing effect. The only other disadvantages of a variable shutter are the problems it creates from a camera design point of view such as the increased potential for camera noise due to the increased number of moving parts, etc.



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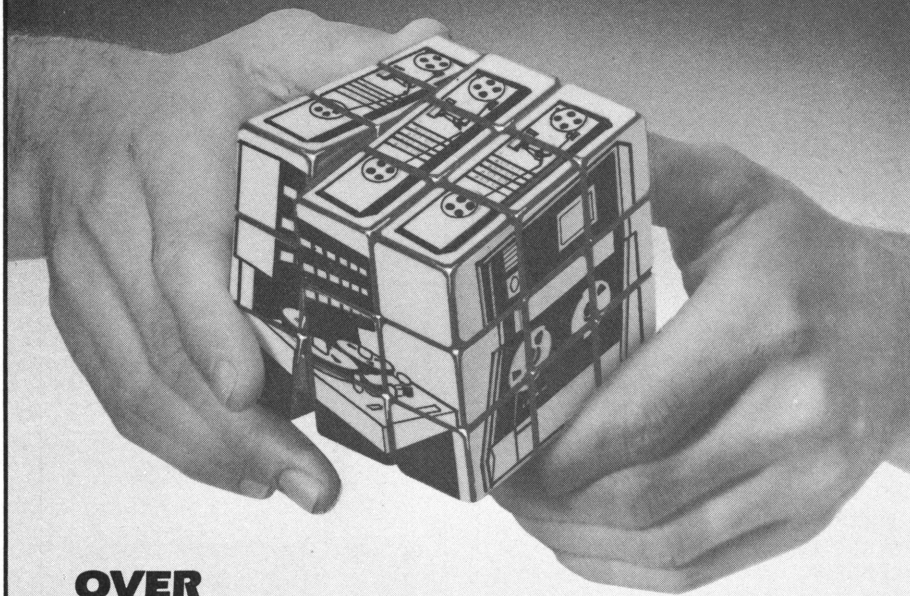
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by GEORGE L. GEORGE

STATE OF THE CRAFT

The technological know-how behind the eye-boggling artifices of such films as *Star Wars* is explained by expert Zoran Perisic in **SPECIAL OPTICAL EFFECTS**. His practical and comprehensive account covers appropriate equipment and lab procedures which, when handled by creative technicians, achieve spectacular results (Focal Press \$29.95).

In **BASIC FILMMAKING**, Dana H. Hodgdon and Stuart M. Kaminsky offer knowledgeable guidance to fundamental methods for small-scale independent production. The scripting, shooting and completion stages are effectively handled in a clear, well-illustrated text (Arco \$12.95/7.95).

An essential aspect of animated film production is discussed with thorough competence by Harold Whitaker and John Halas in **TIMING FOR ANIMATION**. Determining and achieving the proper speed of movement on the screen is viewed as the basis of all successful animation (Focal Press \$25).

Donald C. Willis's **HORROR AND SCIENCE FICTION FILMS** (Vol. 2) is a conscientious compilation of some 2000 movies, mainly from the 1972-81 period. Cast, credits, synopsis, suitable comments and effective cross-referencing provide a reliable overview of this popular genre (Scarecrow \$28.50).

In **HOLLYWOOD: THE FIRST HUNDRED YEARS**, Bruce T. Torrence traces the history of the 7 square mile tract now known as Hollywood from 1769 when it was called Cahuenga by Spanish explorers to its less than glamorous present. Torrence's informative commentary, both factual and anecdotal, offers fascinating insights tinged with nostalgia (NY Zoetrope, 80 E. 11 St., NYC 10003; \$24.95/15.95).

A new yearly directory, **VARIETY: INTERNATIONAL MOTION PICTURE MARKETPLACE 1982-83**, meticulously edited by Mike Kaplan, is an authoritative source of valuable information about production, distribution and service companies active in 101 countries from Algeria to Zimbabwe, including the U.S.A. (Garland \$50).

Numerous performing arts and entertainment industry figures appear among other outstanding personalities in **PSEUDONYMS AND NICK-NAMES DICTIONARY** (2d ed.), Jennifer Mossman editor. Some 50,000 assumed names used by nearly 40,000 real persons are listed with basic biographical/career data and a full cross-index (Gale \$125).

A PRIDE OF DIRECTORS

Howard Hawk's innovative approach to film pacing, story construction and characterization of women are discussed in three current books. An addition to the scholarly Twayne's Filmmakers Series, Leland A. Poague's **HOWARD HAWKS** presents a detailed biography, a complete filmography and a wealth of reference material. A thoughtful critical study notes Hawks' ambivalent attitude toward women, either treated as female sex objects or ascribed masculine behavior (G. K. Hall \$15.95).

Similar views are held by Robin Wood in **HOWARD HAWKS**, a timely expansion of his 1968 book. Wood discusses at length the prevailing themes in Hawks' work, among them the reversal of sex roles (NY Zoetrope \$10.95). Joseph McBride's extensive interviews with the director are collected in **HAWKS ON HAWKS**, probing his work methods, rapport with writers and performers, and his avowed preference for assertive, liberated women (U. of California Press \$14.95/6.95).

A notebook kept by the controversial German director Werner Herzog during his journey on foot from Munich to Paris, now published as **OF WALKING ON ICE**, is a sensitive document that reveals the director's inspiration sources in the sights, events and encounters that occurred during his trip (Tanam Press, 40 White St., NYC 10013; \$9.95/4.95).

The director's role as the central creative source in the making of a film is the premise of Gene D. Phillips's perceptive study, **GEORGE CUKOR**. A volume in the Twayne's Filmmakers Series, it carries valuable documentation on Cukor's films and career, a selected bibliography and above all an enlightening appraisal of his creative understanding of the medium (G. K. Hall \$16.95).

The complex personality of the late German director, Rainer Werner Fassbinder, and his harshly realistic films are discussed in **FASSBINDER** by a

group of German filmmakers and critics. This probing monograph, which includes also an interview with the director, examines the nature, themes and politics of his films, and their brilliantly innovative contribution to cinema art (NY Zoetrope \$15.95/7.95).

AND A CAST OF THOUSANDS

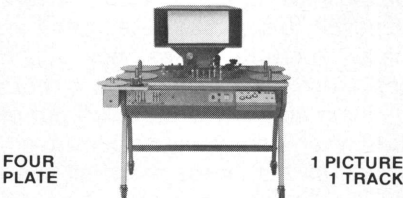
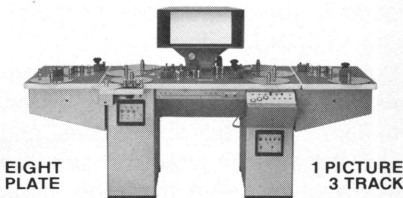
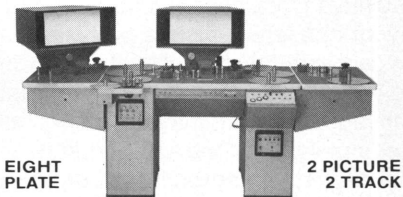
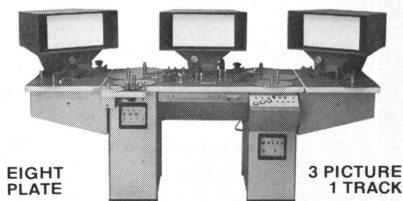
For the 20th anniversary of Marilyn Monroe's death, James Spada and George Zeno have assembled a stunning album of 230 rare photos, **MONROE: HER LIFE IN PICTURES**. Appropriately captioned, they evoke a tragic and fascinating personality that enraptured an era (Doubleday \$24.95/14.95). In **ELIZABETH TAYLOR: TRIUMPH AND TRAGEDY**, Bill Adler reports many indiscreet details of the star's turbulent life, letting the facts speak eloquently for themselves (Ace \$2.95).

Lana Turner leaves little unsaid in **LANA: THE LADY, THE LEGEND, THE TRUTH**. Managing to survive husbands, lovers, alcoholism, abortions, a murder, a suicide attempt and 57 films, she emerges at 60+ remarkably unscathed—a serene "new woman" (Dutton \$14.95). In her candid and often poignant autobiography, **JUNE ALLYSON**, the actress evokes her path to stardom, her marriage to Dick Powell, her breakdown after his death and her eventual recovery (Putnam \$14.95).

In **PETER SELLERS**, Alexander Walker sketches the late actor's life and career with much personal detail, revealing his quirky and insecure personality, as well as highlighting his unquestionable comedic gifts (Macmillan \$13.95). Photographer Ray Schatt's **JAMES DEAN: A PORTRAIT** combines his pictures of the young actor with Dean's own photographs, offering an interwoven collection of moody, informative shots enriched by intimate memories of their friendship (Delilah \$8.95).

In **BOGIE AND ME**, Bogart's hairdresser Verita Thompson tells of their 15-year affair during his marriages to Mayo Methot and Lauren Bacall. It sounds plausible enough, but the inept telling robs the story of any potential piquancy (St. Martin's \$12.95). Character actor C. Aubrey Smith is warmly profiled by David Rayvern Allen in **SIR AUBREY**, a lively biography of the performer who personified the quintessential British gentleman (Hamish Hamilton, N. Pomfret, VT 05053; \$31.50).

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TALKING TECHNICALLY

By DAVID W. SAMUELSON

LOOKING AT LENSES

Undoubtedly some lenses are superior to others and what is important is less of how good one particular lens is—unless you are going to shoot the entire production on one lens—but how do they all compare overall. One may have to balance the advantages, say, of one lens which is pin sharp in the center but which falls off slightly in the corners and yet has good contrast with another that may be sharp all over but lacks contrast. Either way one has to compromise depending upon the priorities of a particular production or the predilections of the director of photography.

There are many other considerations too, such as geometric distortion, flare and colour aberrations, and do all the focusing barrels turn the same way and read from the same side, do you really need wide aperture lenses which may not be as good as smaller aperture lenses, how much does a lens stop down, does a zoom lens jump and momentarily go out of focus when you change zoom direction, do all the lenses fit on all cameras, how much diffusion and smoke is the D.P. going to use or does the shoot demand knife edge sharpness, how much does the colour balance between lenses vary (only really important if one-light dailies are to be a regular subject for colour balance concern and criticism) and so on? While most of these questions, and others do not normally present problems they do need to be answered before a major production commences and this can only be done by deciding priorities and making tests.

Before supplying a lens to a client the manufacturer or rental company will have done a certain amount of optical testing on an optical bench, but this may not have been done immediately prior to the lens being supplied to a client and lenses do sometimes deteriorate with use.

Most probably the tests that will have been carried out are to take a physical look at the lens to check that it is not badly chipped or scored (one or two small marks won't hurt), that the focus, zoom and iris controls all operate and that when focused to, say, 6 ft., it does read 6 ft. on the

scale. It may also be that a collimator has been used to check infinity settings. In the final analysis there is no substitute for the crew shooting film tests and looking at these both under a microscope and on the screen.

Most rental houses use a system of projection on an optical bench as their primary means of lens testing. By this method one can easily see focus and check it against the lens scale, get a sense of how much a lens improves as it is stopped down and whether a lens has good contrast or not, see what barrel or pincushion distortion there is, see how clean the conjunction of black areas with white areas is (flare and colour aberration) and check zoom lenses for holding focus and straight tracking through the zoom range.

Looking at an image on a ground glass is perhaps the worst way to check lens performance and at best is only good for setting and checking comparative focusing distances. On a recent visit to Panavision in Los Angeles I saw how they use a spinning ground glass disc when scaling lenses to minimize the effect of the hills and valleys on the surface of the ground glass, thus minimizing its coarseness. On some lenses, most notably their 19, 24 and 29mm sphericals they have engraved a tiny green dot alongside the index line to indicate to camera assistants where they should eye focus to so that the perceived focus on the ground glass screen will coincide with the optimum focus on film. Although the difference may look to be quite considerable on a focus scale it only represents about two thousandths of an inch in back focal distance or about the same displacement as putting a gelatine filter behind the lens . . . and no-one seems to worry about that.

With long focal length lenses you cannot even be sure that infinity will be the same setting from one day to the next. A far distant mountain range will appear to be a different distance away on a clear morning after the air has been washed by rain than it will on a smoggy afternoon when there is a day's pollution in the sky. Changes in humidity may also affect the focus

calibration of lenses with fluorite elements. They may not be the same in the desert as they would in a Turkish bath.

The ultimate check for focus at any distance and any aperture is to shoot some film at slightly different settings and to compare the results with the aid of a microscope.

In France they check lenses by sticking a small piece of graph paper over the index line and shoot a few frames on the line and at plus and minus one, two and three millimeters. They do this on zoom lenses at various focal lengths, at various distances and at various apertures.

Some zoom lenses have little quirks worth knowing about and although there is usually nothing one can do about it—because that's the way they are—it's worth knowing the limitations. Some change focal lengths (image size) when the focus is changed, some have image jump and momentarily go out of focus when the zoom direction is changed, some don't track straight, some don't focus closer than about four or five feet and few are comparable in terms of definition, contrast and aperture to fixed focal length lenses. Some are so heavy that they must be supported or else there will be a severe focus difference between the top and bottom of the screen.

With some lens and camera combination there may be a variation in focus and/or camera noise when doing an exaggerated tilt up or down and in others there may be a difference in camera noise between different lenses and when focused at infinity and when focused for a close-up.

When shooting lens tests and comparing lenses one needs to shoot a test chart which is large enough to satisfactorily accommodate the widest angle lens and then to cover the same field for all lenses, increasing the distance between the camera and the test chart for longer focal length lenses rather than shooting at the same distance all the time.

Above all, the test chart must be lit from the extreme sides or top and bottom so there is no possibility of the



Merl Dobry takes off again...

with Cinema Products custom-designed camera mount and GSMO.

Hit head-on by the landing gear of a fast-descending stunt plane he was filming, Merl Dobry got knocked off his camera car. Regaining consciousness three and a half weeks later, the famous aerial cinematographer, sky-diver, underwater and stunt cameraman found himself with his right shoulder and arm shattered with some 20-odd compound fractures and major damage to arteries and nerves.

Undaunted by the near-fatal crash, three years of reconstructive surgery and physical rehabilitation—and despite the resultant permanent paralysis in his right shoulder and arm—Dobry was determined to use his reborn skills and get back into production.

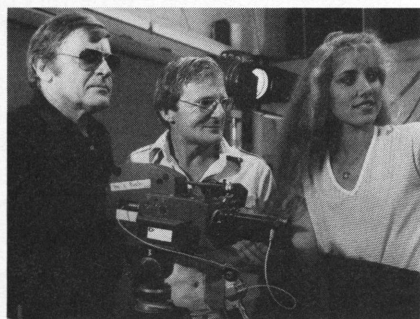
"My main problem, though, was how to use standard camera equipment which is basically designed for two-handed operation," says Dobry, whose production company is based in Santa Barbara, California. "Enter Cinema Products and GSMO.

"GSMO, of course, was the obvious choice. Not only is it the most lightweight professional 16mm production camera around, it also features crystal-controlled variable speeds from

12-64 fps (including an optional 30 fps speed), integral auto slating and pilotone outputs, and a choice of quick-change cassette-load magazines—the standard 400' magazine as well as the new, low-profile, ultra-lightweight 100' magazine. A most versatile 16mm production camera for a wide range of applications. In short, just what the doctor ordered.

"Moreover, Cinema Products' outstanding engineering team was willing to go the extra mile on my behalf. Constructing a custom-designed GSMO mount (patterned after the Steadicam® operator's vest), with J-5 handgrip power zoom and camera start/stop control adjustable for convenient left-handed operation. Comfortable and functional to the last detail. In case of emergency, I just pull on the rip cord . . . and I'm free of camera and mount in seconds!

"Thanks to Cinema Products, sporting my best 'designer suit' and GSMO, I'm back in the swing again. Working on commercials and documentaries. Flying and filming again."



Merl Dobry (center) lines up the next shot for a Weinmann ski boots commercial, produced for the Robert Hammond agency (Santa Barbara), as creative director Bob Hammond and model look on.

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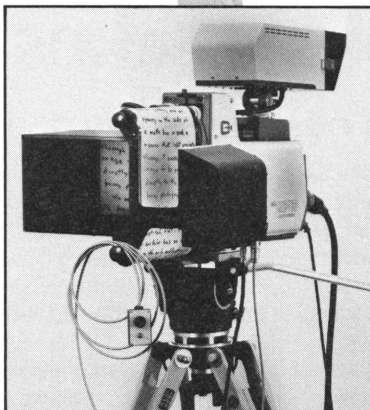
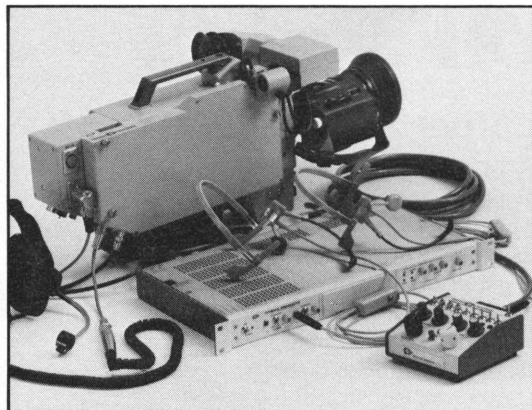
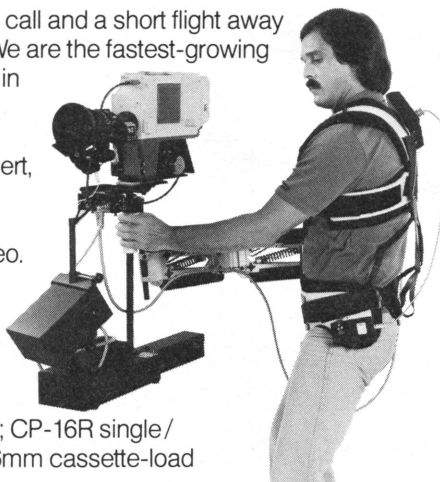
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And we are the exclusive dealer for all Cinema Products equipment: film and video.

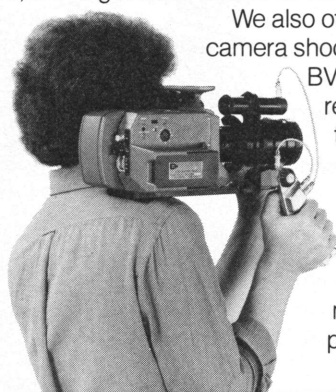
For example: the Oscar-winning Steadicam® camera stabilizing system; Camraprompter; U/F-16 and U/F-35 film editing consoles; Co-Ax digital remote control systems for ENG/EFP cameras (from distances up to 5000 feet!); CP-16R single/double system sound cameras; GSMD 16mm cassette-load



cameras (available with both 400' and ultra-compact 100' magazines) . . . You name it, we've got it. For sale or for rental.

We also offer special video rental packages for single/multiple camera shoots, featuring the CP Co-Ax system for use with Sony BVP-250, 300 and/or 330 video cameras (available for rental with or without Sony cameras), 3/4" and 1" portable VTRs, RDS/HMI lights, and support equipment. Plus a complete line of accessories, lenses, and Portable Energy power supplies to take care of all your production needs.

So when you plan your next shoot—film or video—give us a call and check us out first. Find out what we mean by "service," and why we are proud to make it part of our name!



lighting being reflected back into the camera and causing a flare. I always say 'imagine a tennis ball coming out of the centre of a lens, hitting the furthestmost edge of the test chart and bouncing towards any one of the lamps illuminating the chart. All the lamps should be out of range.' The object of the exercise is to explore the lenses, not the non-reflective properties of the test chart.

When looking at tests don't expect all the very finest detail to be resolved or resolved the same all over. Compare the detail at the center with that 70% out and make sure that the fall-off is about the same all round. Look at the contrast of the picture and take this into consideration when looking at resolution. The result is 'definition.' A flat lens with fine focus is not usually as desirable as a lens with more contrast but slightly less resolution.

Look at the geometry of the image to check for barrel or pincushion distortion. Look at a large black area adjoining a large white area and see if the whites are bleeding into the blacks (flare). Look at a large white area adjoining a large black area and see if there are colour fringes (colour aberrations). Check the resolution at two stops down from full aperture and compare the resolution at full aperture. Check the focus at different distances and at infinity. Check if the focus changes with stop. Check which aperture gives the best results. Check the exposure is the same for other lenses at a similar aperture. Check that the exposure is the same across the picture. Check the corners for vignetting. Check that zoom lenses hold focus through the zoom range. Check zoom lens tracking by zooming in on a particular object and note how constant it remains relative to a cross marked on the centre of the screen (it may vary by 2% of the diagonal and still be within tolerance).

Don't worry about differences in the colours of the glass coatings and don't worry about slight differences in the colour bias of the photographed images—it would have to be very bad for it not to be correctable in the printing.

Check depth of field. Paradoxically a lens that has exceptional resolution may appear to have less depth of field because what is sharp is so sharp that anything slightly off may look worse by comparison.

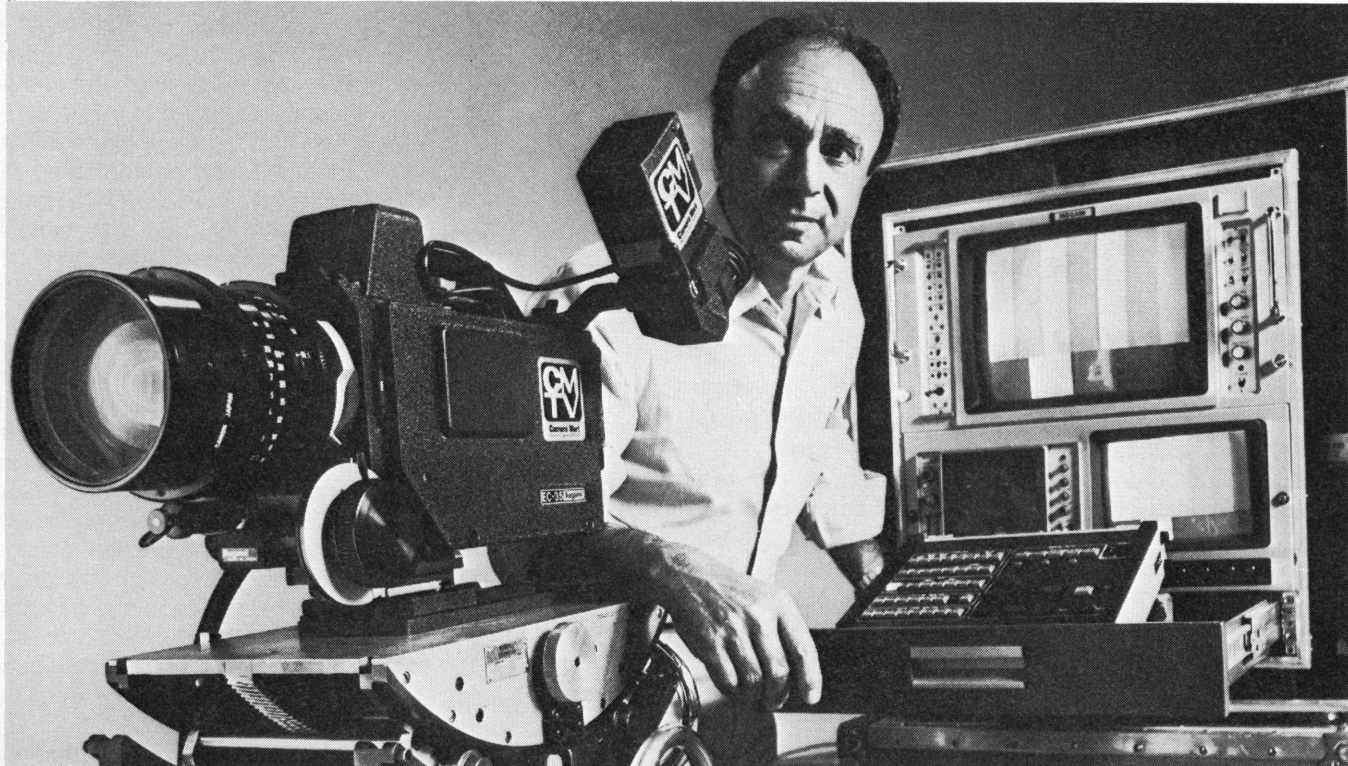
Your lenses are very important to you, you ought to get to know them really well. ■



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**"Although I still do most work on film,
I now welcome the opportunity
to work with tape.
Thanks to the Ikegami EC-35."**

Adam Holender—ASC

"I can hardly describe myself as a tape expert. Some years ago I had less than favorable experiences with tape, and since then I have pretty much stayed away from it. After I attended the Ikegami EC-35 camera seminar at Camera Mart, however, I decided to try tape again, and for the first time I felt comfortable with it.

"In the production of television commercials, which I direct and photograph, tape is usually requested when it's a matter of expedience, and finished spots have to be delivered to the networks fast. Now, I believe, with this new available technology, the visual quality does not have to be compromised.

"I have used the EC-35 in the studio and on location. My approach was quite simple.

I decided to ignore the fact that I was dealing with tape, and work as if I were using film. That meant a film camera crew, a gear head for the camera, and the lighting I would have used for film. It all worked well, and it was particularly helpful to have color control of the image being recorded, right then and there, on the set. It felt much like having the benefit of a trusted laboratory timer in the usual post production on film, only with the Ikegami system one could see the quality of the answer print on the monitor before shooting.

"Although I still do most work on film, I now welcome the opportunity to work with tape."

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WHAT'S NEW

IN PRODUCTS, SERVICES AND LITERATURE

MILLER FLUID HEADS

R. E. Miller Pty. Limited introduces the Miller 30 and the Miller 50 fluid heads designed for today's state-of-the-art E.N.G./E.F.P. cameras.

These compact heads feature an advanced concept fluid drag system that ensures consistently smooth, repeatable pan and tilt actions through a range of three pre-set drag positions. In addition, both pan and tilt actions can be set in "free-wheeling" positions. Perfect balancing of cameras is assured within seconds by engaging the built-in counter-balance system, thus eliminating nose- or tail-heavy camera configurations. This system can also be activated to re-set neutral balance when the camera's center-of-gravity changes with the addition of accessories, thus pre-



venting accidents that occur with unbalanced equipment on heads that are not locked. The Miller 30 has been designed primarily for ENG cameras while the Miller 50 is best suited for EFP applications.

Both heads provide a choice of two camera platforms, a quick-release platform, and a sliding camera plate with built-in quick-release. The sliding camera plate allows 100mm of movement to complement the counter-balancing system. Handles may be used left- or right-hand and are vertically and horizontally adjustable. Locking is completely safe due to built-in disc brakes in both the pan and tilt. The heads are made of rugged durable aluminum construction finished in black anodized/epoxy paint to resist wear and corrosion and weigh 7 lb 2 oz (3.4 kg).

Complete specifications may be obtained from: Innovative Television Equipment, P.O. Box 681, Woodland Hills, CA 91365. (213) 888-9421.

"TWO-ON-ONE" LEAD-ACID BATTERY BELT

Portable Energy Products announces the availability of the new "Two-on-One" sealed lead-acid battery belts. These units are ideal for use with ENG/EFP video cameras especially when shooting in tight quarters and in low light situations, as well as under inclement weather conditions.

The innovative design of the "Two-on-One" battery belt allows it to power—*simultaneously*—a video camera and a 100W sun-gun type light. This eliminates the need for two battery units, reduces the weight load on the cameraman and increases his maneuverability in news conferences and other reduced-light situations.

The "Two-on-One" battery belts are available in two configurations: for 12V and 14V video cameras, both operable with camera-mounted 100W sun-gun type lights.

"Two-on-One" battery belt packages are supplied complete with built-in meters, chargers that won't overcharge, and crack-resistant naugahyde belts with convenient velcro closure.

For further information on how you can arrange for a *free* two-week trial of the "Two-on-One" battery belt, please contact: Portable Energy Products (indicating the make and model of your equipment) at 1875 South Pearl Street, Denver, CO 80210 or call (303) 778-8616.

STUDIO CAMERA STAND FOR SPECIAL EFFECTS

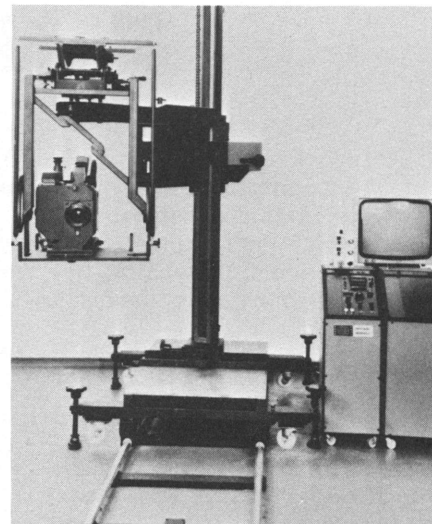
A British-made, general-purpose special effects camera stand has optional computer control and is said to be the first of its type in standard production.

Designed to accept many kinds of cameras and to provide accurate camera movements when creating studio-effects filming (e.g., multiple-exposure zooms and pans or stop-

frame model animation), the MODEL 21.00 STAND can also have computer control to provide pre-programmed and repeatable accuracy in live-action and multi-exposure work. Eight functions can be controlled by the computer, including tracking, camera elevation, pan, tilt, camera run, shutter open and close and shutter dissolve.

The stand has a heavy-duty steel column on a movable platform, which fully rotates about its axis to track in or out of sets built at either end or for crabbing past or over the tops of models. The platform can be mounted on tubular tracking rails. Nylon castors on the base ease transportation. A camera-mounting bracket on the column is gear driven up and down and has a position counter. The camera can be mounted directly on the bracket pointing down or can face forward if mounted on an extension arm.

When the 3.6' long arm is attached to the bracket top, the maximum lens height is 9.8'; when the arm is attached to the bottom of the bracket, the camera can be brought closer to the floor. The arm can also be fitted with a pan geared and tilt camera head for tilting 30°; this angle can be increased with wedge plates.



An optional slung cradle, which can be fitted to the pan and tilt head, gives a minimum lens height of 10" above floor level. The cradle has a quadrant bracket which can increase downward tilt to 90°.

For further information contact: Neilson-Hordell Ltd., Central Trading Estate, Staines, Middlesex TW18 4UU England. (0784) 54105 or Alan Gordon Enterprises, 1430 Cahuenga Blvd., Hollywood, CA 90028. (213) 466 3561.

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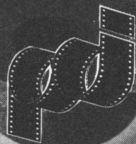
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New high-speed color reversal film designed for daylight use

When speed is important, so is EASTMAN EKTACHROME High Speed Daylight Film 7251. It helps catch the action, no matter what that action is—the impact of an automobile crash on test mannequins, the path of a missile, the intricacies of a heart-valve operation.

Ray Pfitzner, supervisor of photographic services at Chrysler Proving Grounds, reports that 7251 provides increased detail in shadow areas. "What's more," he says, "it allows us to stop down for depth of field when we're shooting high-speed situations of vehicles being crash-tested!"

Ernie Ernst, NFL Film's director of photography, calls 7251 "everything we could hope for and more.

"We can now shoot slow-motion action in stadiums where previously we had problems," he adds. "When pushed one stop to ASA 800, 7251 gives us fine results, even with borderline stadium lighting."

In addition, exceptional color fidelity is available under normal daylight conditions. And you may also find that color quality is improved over that of many other daylight-



balanced films that are used with xenon and metal-halide lamps.

7251 provides $1\frac{1}{3}$ stops more speed than other currently available daylight-balanced films.

So even when shooting under less than perfect conditions, you'll get more sharpness and less grain than from pushing slower daylight-balanced films.

Using force processing, 7251 can be exposed at effective speeds up to twice the normal exposure indexes—with little loss in quality. And where minor quality loss is acceptable, the normal exposure index can be increased by the equivalent of two stops.

All of which makes 7251 sufficiently versatile to accommodate a variety of filming situations, from time-and-motion studies, to kinematics, to underwater photography.

To obtain more information on EASTMAN EKTACHROME High Speed Daylight Film 7251, just return the coupon below.

Less expensive checkerboarding made possible by new EASTMAN Black Leader.

New EASTMAN Black Leader 5983/7983 is a cost-effective alternative to using exposed and developed black-and-white print stock as a motion picture conforming leader.

With 5983, it's no longer necessary to buy a separate black-and-white film to obtain black leader, or to use leftover pieces of film. And, because black, silverless 5983 doesn't need to be exposed or developed, it saves both time and money in preparation for printing.

This new silverless leader produces results equivalent to those obtained with traditional black leader when tested for characteristics such as optical density, spliceability, scratch susceptibility, and chemical reactivity with film-cleaning, processing, and wet-printing solutions.

EASTMAN Black Leader 5983/7983 is available from Kodak in 35 mm and 16 mm widths, in 1000-foot lengths—and it's priced significantly lower than other products used for the same purpose.

Discover the benefits of EASTMAN Black Leader for yourself. Try some on your next project.

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Communicator's Catalog provides shortcuts for film professionals

Now, when experimenting with various motion picture techniques, you can benefit from the experience of other professionals, by reading or watching one or more of the 260+ "how-to" publications and programs described in Kodak's new *Communicator's Catalog*.

This single volume divides visual communications into four major disciplines—motion picture, television, multi-image, and audiovisual. A wide selection of resources is listed for each discipline, including several self-help publications. And recommended essentials—



including items such as templates, charts, and posters—are also described in detail.

An area of interest can be found by using the table of contents, or—if the interest is specific—the topic index can be consulted instead. An alphanumeric list of available titles is also included.

To make sure the information contained in the *Communicator's Catalog* is available when you need it,

just return the coupon, and a copy will be sent to you at no charge.

THE REBIRTH OF 3-D

by MICHAEL STARKS

Stereoscopic moving images have been investigated for more than 100 years, with such exotic devices as stereozopraxinoscopes antedating movies. British film pioneer W. Friese-Green made a short three-dimensional film on celluloid strips in 1889, and the Lumiere brothers demonstrated on anaglyph film at the World's Fair in Paris around the turn of the century. Anaglyph films are those in which the viewer wears colored glasses (usually red-green) just like those used for 3-D comic books. This technique continues to be used for films and TV, but it creates eye-strain, cannot be used for full-color images, and is a sure way to create hostility to the medium. Nevertheless, there are a variety of American and Russian researchers who continue to work with this obsolete technology.

When we began researching 3-D eight years ago, we assumed that all we had to do was follow the recommendations in the standard texts and articles to get good results. However, as I dug up literature and Lipton began testing the recommendations with his double-camera super 8 3-D system, it became evident that mass confusion prevailed. Only after four years of work did we find that Russian stereographers had arrived independently at conclusions very similar to our own. The Russian films are rarely shown in the West, and we have been unable to determine how their theories are actually applied in their films. Most of the older Russian work is described by Valyus in his book *Stereoscopy* (1962), but the more recent research has been specially translated for us.

Very few people have any experience in evaluating 3-D film and video, and one of the major barriers to the advancement of the medium is that most of the producers, exhibitors and viewers are indiscriminating. However, the present tidal wave of 3-D interest and enthusiasm is stimulating the tardy maturation of the medium.

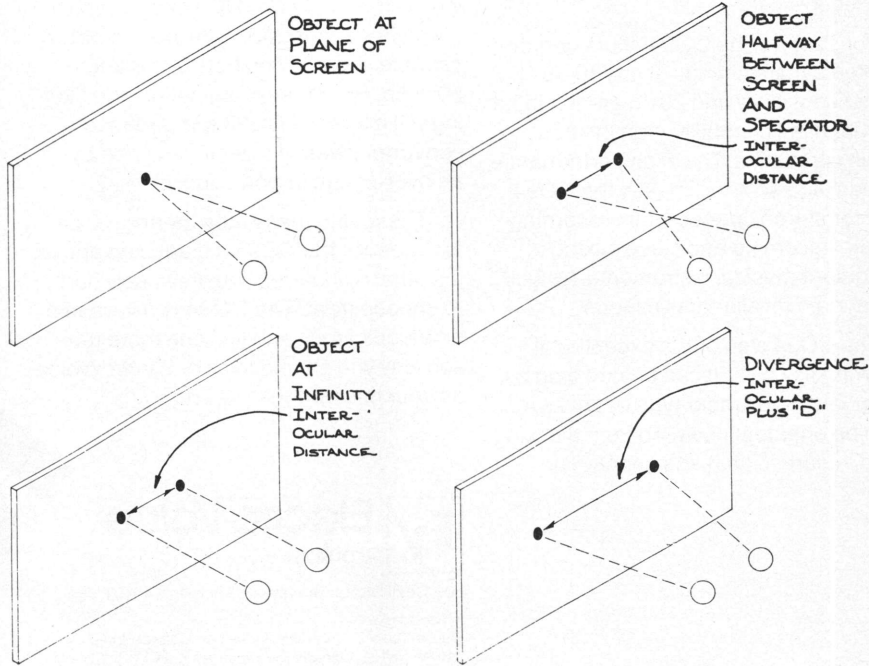
The modern polarized technique for presenting 3-D became feasible when Edwin Land patented methods for

producing polarizing filters cheaply in the early 1930's. Though they come in many varieties, all polarizing filters work the same way. Ordinary light tends to be randomly polarized, with its electric and magnetic fields being at every possible angle. When passed through a linear polarizer, only those photons having a component of their electric field parallel to the plane of polarization will pass through. This means that half the light goes through and half is absorbed or reflected. The light that passes through is said to be plane polarized, and when viewed through another polarizer this light can be either transmitted or almost completely blocked, depending on the

angle at which we place the second polarizer.

This method is used to view 3-D movies by placing two pieces of polarizer at right angles to one another in front of the left and right eye images respectively. These polarizers are sealed in the 3-D projection lens in Chris Condon's design. The two polarized images are projected onto a silver (aluminized) projection screen and viewed through glasses having the right and left eye polarizers at the same right angles as those in the projection lens. The brain fuses the two images to create depth much as it does in the "real" world. The screen has to be aluminized because ordinary screens will depolarize the images. The aluminum screens have the additional advantage that they reflect more light to the audience (they have a higher gain), and this is

Various possibilities for horizontal displacement (parallax) of left and right image pairs on a movie or tv screen. No parallax results in the object being seen in the plane of the screen (above left), while parallax of about 2½ inches makes the object appear distant or at infinity (lower left). More than 2½ inches positive parallax (right eye image to right and left to left) forces the eyes to diverge or angle outward to fuse the stereo pair (below right). When image pairs have negative parallax (right eye image to the left and left to right), objects appear to stick out of the screen. When the negative parallax is approximately equal to the average human interocular distance of 2½ inches, the object tends to appear halfway between the viewer and the screen.



Think of us as your mike expert.

The CO94. All miniatures are not created equal.

Until now, the engineer faced with selecting a miniature microphone was hard pressed to find any dramatic differences in performance. That is, up until the Electro-Voice CO94.

For starters, the CO94 offers unprecedented dynamic range. It has 10 dB greater sensitivity and 20 dB greater input SPL handling capability than the best known competitor. This high performance in a package so small makes the CO94 ideal for stereo spaced-omni recording, binaural recording and close miking of high output musical instruments, as well as standard lavalier applications.

The CO94 also offers exceptional powering flexibility. It can be powered by a standard 9-volt radio-type battery. Or it can be phantom powered from a mixing board, recorder, or in-line supply. The

9-volt battery can even be used as a redundant power source to "back up" the phantom power. Plus, the CO94's advanced electronic design permits powering from virtually any DC power supply, (even an "el cheapo" battery eliminator) capable of delivering between 8 and 50 volts. The internal regulation and filtering will make the CO94's impedance converter swear it's being powered by an over-priced import supply.

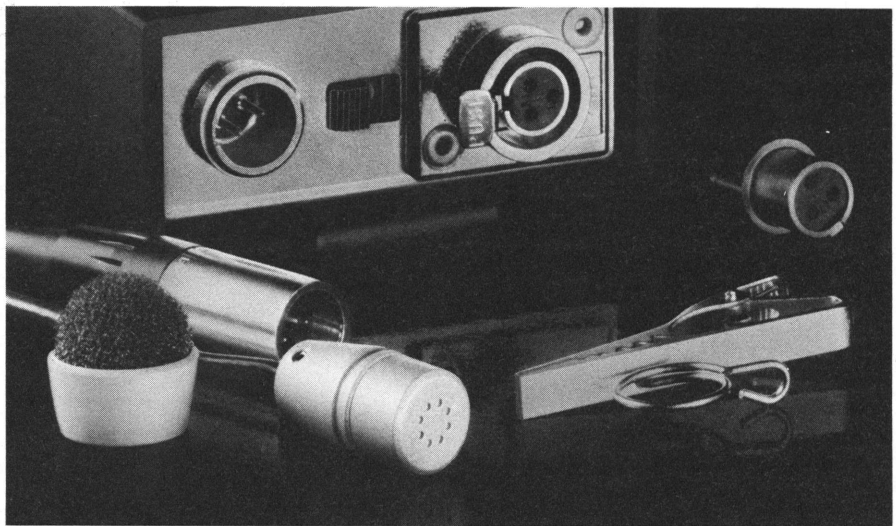
These and many other performance features set the CO94 a giant step above the other miniatures you previously had to choose from. The CO94 is a versatile new kind of tool, and just one more reason why you should think of Electro-Voice as your microphone expert.



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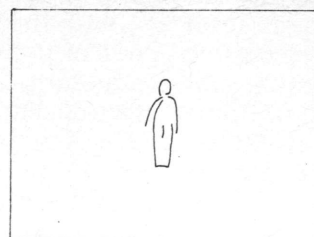
important since about 75% of the projector light is blocked by the polarizers.

This brings us to the question of illumination. For good stereoscopic movies it is very important that bright, even illumination be obtained. We have found that projector lamps with a deep dish reflector and a horizontal xenon arc are optimal, and that their wattage should range from 2000 for a small theater to 4000 or 5000 for the largest. Also, the lamp should be adjusted and the projector tilted to maximize brightness and evenness of illumination. Consequently, Stereographics Corp. has applied for a patent on a test leader which will be used on all our films. This test film contains red and green areas in place of the right and left eye images, so that any unevenness of illumination is apparent as a red or green area in the otherwise orange field. This may seem like a trivial point, but we have discovered that uneven illumination is an excellent way to produce eyestrain. The reason is that a given part of the left eye image will be darker or lighter than the corresponding part of the right eye image. Since this does not occur in nature, difficulties in processing this information in the optic cortex lead to a variety of neurological symptoms commonly termed "eyestrain."

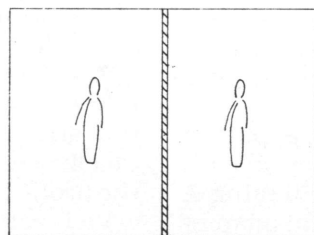
Our test leader has one other essential aid previously unavailable to the 3-D projectionist. The red screen image is marked "right" and the left is marked "green." When the projectionist closes his right eye, he should see only a green screen, and only red when he closes his left eye. The 35mm projection standard that is emerging has the right and left eye images above and below one another on a single strip of standard 35mm film which is projected with a single, standard 35mm projector.

PARALLAX

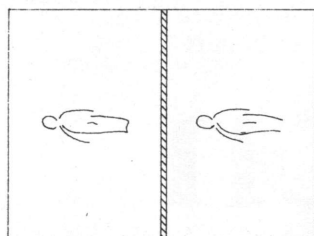
A crucial concept in the making and showing of 3-D films is parallax. Horizontal parallax is the horizontal displacement of the right and left eye images, which is the depth cue distinguishing 3-D from 2-D (flat) pictures. Our eyes are about 2½ inches apart, and this gives good parallax for close objects. We can still perceive depth in more distant objects because there are other depth cues such as interposition, perspective, shadow, etc. which work even with one eye. Two parameters that are



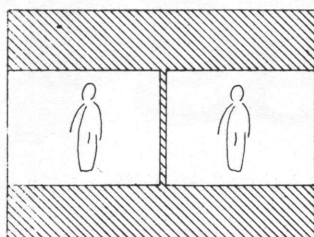
FULL EDISON 1:1.3



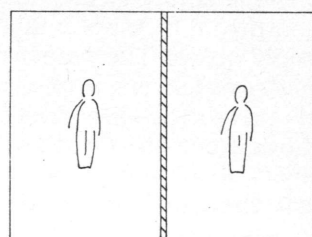
VERT. PLUS ANAMORPHIC



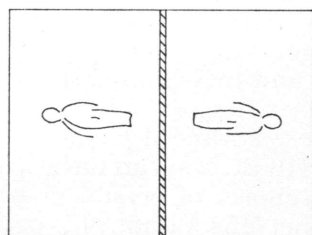
VERT. ROTATED - SAME SENSE



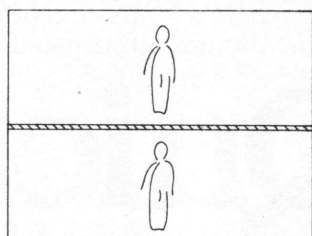
SIDE BY SIDE - 1:1.3



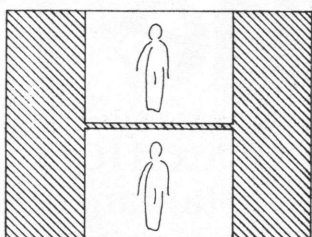
VERT. DIVISION



VERT. ROTATED - OPPOSITE SENSE



OVER AND UNDER (SCOPE)



OVER AND UNDER - 1:1.3

Various 3-D film formats. The full Edison aspect ratio was used for the 1950's double-projector films, while the vertical plus anamorphic was used for HOUSE OF WAX 35mm rerelease. Our over-and-under cinemascope format is also used by the Optix and Spacevision systems. We have used the side-by-side 1:1.3 for 16mm and the over-and-under 1:1.3 for experimental super-8-to-35mm blowups.

relevant to any 3-D system are the distance between the two lenses (right eye and left eye views) and the point at which the optical axes of the two lenses converge. Most modern stereoscopic systems use a single 3-D lens with a fixed distance between the two optical axes, so the main concern in actual practice is to set the point of convergence. The object on which the two axes are converged (the point at which they cross) will have no parallax, and when seen in a theater will appear to be in the plane of the screen. Objects which are between the point of convergence and the camera will have negative parallax (right eye image on the screen will be displaced slightly to the left of the left eye image), and will appear somewhere between the screen and the viewer.

Conversely, objects which are far-

ther away than the point of convergence will have positive parallax, and will appear somewhere behind the screen (in screen space). A simple sketch will show that an object which has a negative parallax on the screen of about 2½ inches (the average distance between our eyes) should appear to be halfway between the screen and the viewer, no matter where the viewer is sitting. In practice, however, such an object will often appear to be in the plane of the screen, depending on the other details of the shot. This is one of many indications that no matter how precisely we control the technical parameters of stereography, it still remains an art.

Two other aspects of parallax should be understood. In order to bring about stereoscopic fusion (left and right eye images seen as a single

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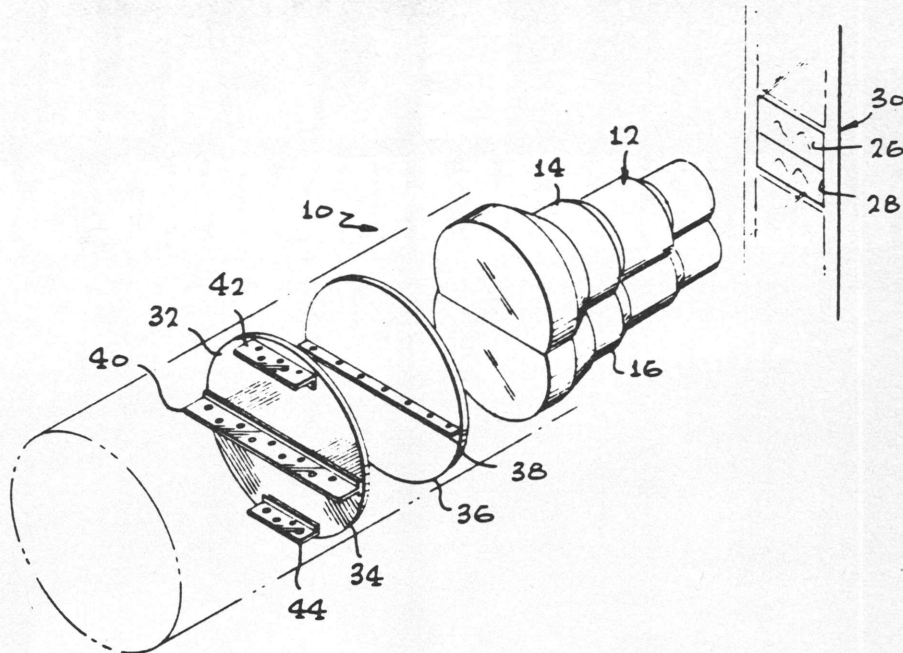
image) of objects with positive parallax, our eyes must diverge (both angle outwards from the center)—something they never do in nature. It is impossible to do stereoscopic photography without some background divergence, and a major dispute in the literature concerns the allowable amount of divergence, since this is likely to cause eyestrain. Early in our researches, we defined the concept of hyperconvergence distance as the distance which will allow acceptable divergence for objects at infinity. This concept has proven extremely useful in helping us to achieve more pleasing 3-D.

Another type of parallax that often appears in 3-D films, but never in nature, is vertical parallax. (On the screen this will be seen as a vertical displacement of the left eye image relative to the right eye image.) Vertical parallax results from mistakes in photography and projection, produces severe eyestrain, and should never be permitted in a 3-D film. Our camera and projection lenses have been designed to eliminate vertical parallax.

When we understand parallax, we are in a much better position to evaluate 3-D films. All we need to do is lift up the 3-D glasses and look at the images on the screen. If we see vertical parallax, or horizontal parallax exceeding a few inches, we know that we are viewing a shoddy product that will produce eyestrain. Another difficulty is uneven illumination of the right and left eye images, which can be detected by alternately closing each eye. Also objects which have negative parallax and which are cut off by the sides of the screen are troublesome.

All of these errors create stresses in the processing of stereoscopic information which are usually lumped as "eyestrain." People say that it makes them feel dull, tired, headache, etc., but many times they can't point to any specific symptom; they only know it wasn't a comfortable experience. This is a likely reason why some people are indifferent or hostile to 3-D, but it is not 3-D but poor technique and equipment that creates problems.

A recent article in *Omni* maintained that breakdown of the accommodation-convergence relationship in 3-D (normally the eyes converge and focus at the same point) creates eyestrain. Our experience shows that if everything else is OK, this is not a



A modern 3-D projection lens for the over-and-under format, shown in a drawing from a recent patent granted to Chris Condon. The left and right eye images pass through a pair of projection lenses, a heat filter, and the polarizing elements.

significant problem for most people. Furthermore, good 3-D seems to get easier to watch as people have more experience with viewing it.

DOUBLE-CAMERA SYSTEMS

From the 1890's till the 1960's most stereoscopic films were shot with double-camera systems. In a typical 1950's system, two cameras were mounted at right angles, both aimed at a semisilvered mirror. One camera shot the left eye image through the mirror and the other shot the right eye image which bounced off the mirror. This system is somewhat cumbersome to engineer and use, and requires careful calibration for each shot to avoid vertical parallax. Also, the shutters of the two cameras must be in phase to within a few degrees. The two strips of film must be processed and printed with care to maintain the same density and color balance. The resulting two strips of film are shown with a pair of interlocked 35mm projectors with either the polarizing or anaglyph technique. Obviously, the two projectors must be in sync so that the same left and right eye frames are shown simultaneously. Less obvious is the fact that the shutters on the two projectors must be in phase to within a few degrees. Also, the relative unsteadiness of the two images, due to differing movements of the two cameras and two projectors, creates eyestrain.

Over the last eight years, Stereographics Corporation has con-

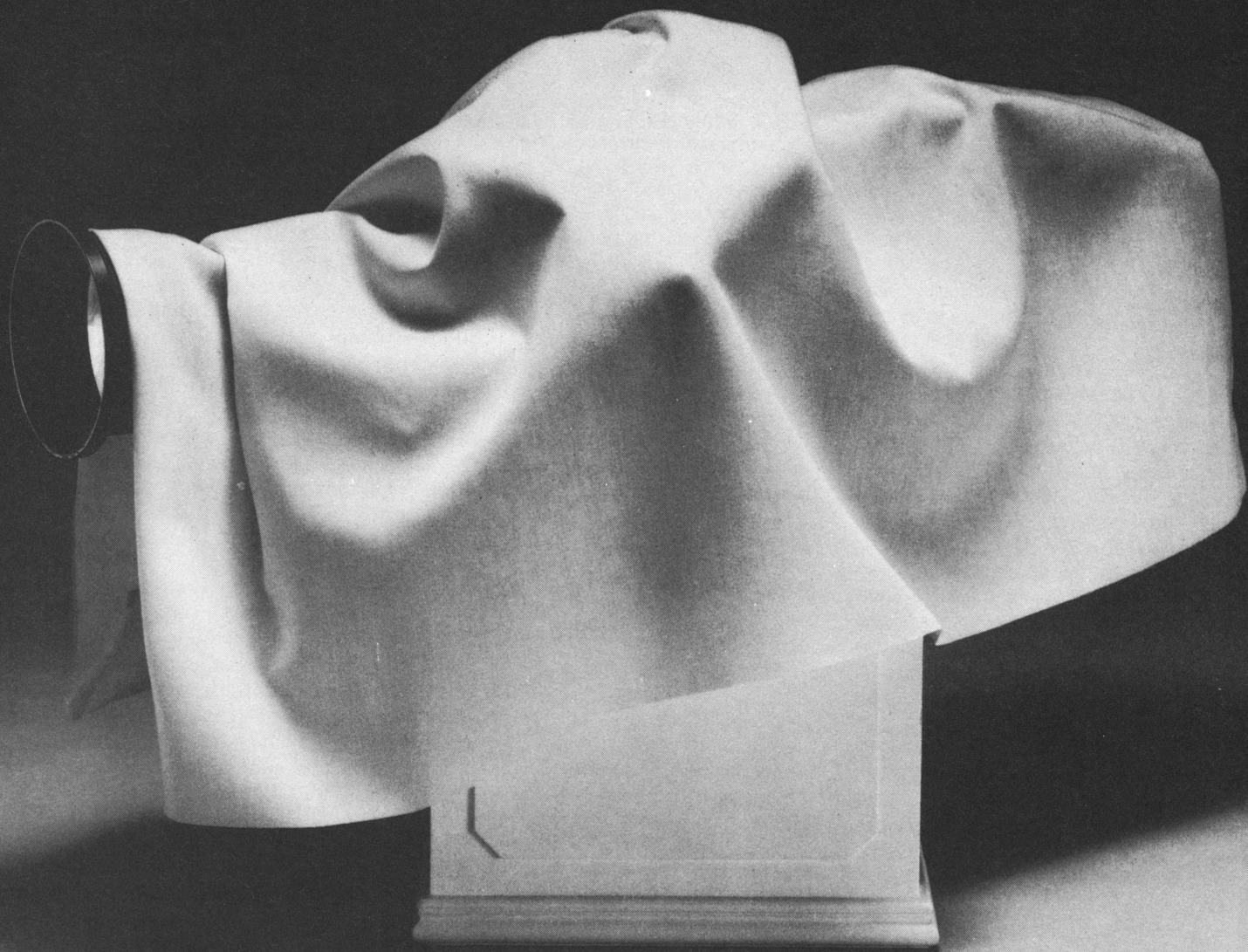
ducted the most extensive investigation ever done on the two-camera two-projector system. We have accomplished the world's first stereoscopic zooms and this technique is among those covered in our first five patent applications on 3-D film and video. Disney Studios and the United Artists Theater Circuit have independently developed dual 70mm systems. Such a system can give spectacular results on very large screens, but the rig is huge and the cost of shooting is substantially greater than with the single-camera 35mm approach.

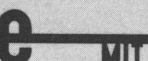
In spite of our considerable work with double-camera systems, we are convinced that the only viable approach is the single-camera, single-lens system. For major productions, we have conceived several 70mm 3-D lenses which we intend to build. However, our new 3-D video viewfinder and 3-D editing equipment make aligning camera pairs, setting up shots and editing in 3-D so much easier that it may give new life to double-system.

There are some advantages to the two-camera system. When very small interaxials (for animation) or very large interaxials (for good stereo of distant objects) are needed, it is difficult or impossible to shoot with the single-lens system. When large interaxials are used, beautiful stereo of very distant objects is possible. In the nineteenth century stereo pairs of the moon were shot through telescopes,

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and I have seen lovely stereo of the earth from pairs of NASA satellite photos. Stunning 3-D of objects filmed with light and electron microscopes has also been accomplished.

Most people who have done 3-D have been rather careless, allowing "little" errors to creep in continually. All of these errors add together and the troublesome consequences are cumulative. Furthermore, a single serious error (e.g., a single screen parallax of several feet that lasts several seconds) may produce eyestrain that lasts for the rest of the film. Actually, the tolerances which must be maintained for strain-free 3-D movies have never been accurately determined, and much research needs to be done on the psychophysics and psychology of stereoscopic moving images.

People sometimes remark that our 3-D films are so effortless to watch that they forget that they are seeing 3-D! Ideally, 3-D should be so good that, except for an occasional shot in which something is pushed far out of or far back into the screen, it should be taken for granted—just as it is in the real world! In a fully matured stereoscopic cinema, the 3-D should not call attention to itself any more than does color or sound. Things should look deep, solid, sharp, clear, lustrous and beautiful in a way impossible to achieve with flat films.

THE ART OF STEREOSCOPY

Getting good 3-D without eyestrain is a subtle art. It's much more complicated than just putting a 3-D lens on a camera and proceeding as usual. We have studied the precise relationships that exist between lens convergence, interaxial, focal length, and viewer distance from a given size screen. We have programmed a pocket calculator to give the acceptable values for convergence and interaxial for a given shot. For certain moving shots, the convergence must be changed during the course of the shot. This was done for many shots in ROTTWEILER. These calculations lead to depth range tables and a hyperconvergence distance for each lens. The depth range tables give the range of acceptable convergences for an object at a certain distance, and the hyperconvergence distance is the point at which you can converge in order to have acceptable parallax for all objects in the shot. Such tables are absolutely essential for doing good 3-D photography—without them everything is just guesswork.

Another subtlety we have discovered is that the single-camera format requires that the camera shutter move vertically to avoid the problem of spurious parallax in moving objects.

TIPS FOR THE VIEWER

Here are some tips on watching 3-D films. Call the theater first to make sure they aren't using red-green glasses—this method is terrible. The farther from the screen you are, the more striking the 3-D and the easier on your eyes. Make sure your glasses do not have fingerprints on the lenses. Keep your head more or less vertical—tipping to the side creates ghostimages (the left eye sees some of the right eye image, and vice versa). Tip up the glasses occasionally to see what is happening on the screen: there should be no vertical parallax, and horizontal parallax should seldom be more than a few inches. With the glasses on close one eye, then the other, to check that all parts of the right eye image match the corresponding parts of the left eye image in brightness, and that no part of one image is blocked or darkened. In ROTTWEILER none of these errors should be present, and you may assume that any problem lies in faulty projection.

THE FUTURE OF 3-D

Stereographics Corp. has built a stereoscopic television. In one version the viewer wears electro-optic glasses that are synchronized with the field scan rate of the modified consumer TV set. Variants of this system have been demonstrated several times, but there are shortcomings, chief of which is a badly flickering image. We have patents pending on the only feasible means of avoiding these problems, and only slight modifications to a standard TV set are required. Three-dimensional programs can be played on ordinary videocassette and videodisc machines.

With this system we have created the first practical 3-D video viewfinder and 3-D editing system for motion pictures. Availability of this equipment should be a great stimulus to 3-D filmmakers with both the single- and double-camera systems.

A question that invariably comes up is "How about holographic movies?" Holographic movies were first demonstrated about 1965, and a very small research effort has since aimed to

perfect them. Little progress seems to have been made, and there are substantial problems fundamental to the holographic process such as the need for coherent laser illumination (how do you film outdoors?), the interference (speckle) patterns, and the lack of full-color holograms with the resolution of film. Judging by the capital outlay to develop such imaging technologies as videodisc players and the consumer videotape recorders and videoprojectors, I would estimate that something on the order of a billion dollars is required to get a good idea of whether high-quality holographic movies are possible, and several times this to create a full-scale theatrical prototype. This is not such a staggering sum (the current U.S. military budget is about \$864 million per day), but who will take the risk when there is no guarantee that holographic movies will be economically viable, even if technologically feasible?

In contrast, the cost of shooting with current 3-D methods is trivial—usually less than 5% of the budget. It should also be kept in mind that a 3-D film can easily be released flat or for TV by showing only one of the images. In view of the minor cost and effort to film in 3-D, it is an excellent way to insure that a picture will make a profit, and it is money in the bank for the day when 3-D TV becomes available. On the other hand, there is no way to go back and turn a flat film into 3-D!

When it's done properly, 3-D is fantastically beautiful, and once you've become used to seeing high-quality 3-D, flat films seem dull—like watching black-and-white TV with no sound. Probably only a few hundred people have ever seen really high-quality 3-D, because there isn't much available.

Lipton and I have sat through dozens of 3-D films by stereographers past and present, and we can pick out serious photographic errors leading to eyestrain and unpleasantly shaped images in the majority of shots. Adding common errors of exhibition (poor screens, dim and uneven illumination, poor masking, etc.), it's no wonder that many have had unpleasant experiences with 3-D films. In fact, we are constantly amazed at how enthusiastic people usually are after viewing terrible 3-D. Well, all who have suffered with these past mistakes have a treat coming—just wait until you see the real thing! ■



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STEREOGRAPHY ON ROTTWEILER

by LENNY LIPTON

Face it—it's hot in North Carolina in the summer. But it's not the heat, it's the Rottweilers. They snarl and make faces and drip saliva. It's taken six years and a considerable effort to get here, to be shooting the feature film *ROTTWEILER* in 3-D, just so we can make dog saliva drip on the head of the man in the twentieth row.

At Stereographics Corp. we uncovered every book, article and patent on the subject of motion picture stereoscopy, and we learned one thing: if anybody knew how to do it, they didn't bother to write it down. My associate, Michael Starks, and I shot tests on our experimental double-system rig for five years. We had subjects view the footage, we interviewed and tested our subjects for acuity of depth perception, we learned about interaxial separation and Panum's fusional area, and hyperstereoscopy, and we sank every dime we had into stereoscopic moving image research. We're now working on the first 3-D feature of any consequence to be shot in the U.S. in the past 25 years. The next shot we are setting up will have the hands of a corpse sticking over row 20, drip, drip, dripping blood onto your lap.

It took Earl Owensby to say "yes" to 3-D. Earl meant it. Earl is a successful independent producer, with 100,000 square feet of studio space, including a giant cyclorama stage, located on about 400 postcard-pretty acres outside of Shelby, North Carolina, on the road to Boiling Springs. We pass Boiling Springs on the way to the wreck of a house where we have been shooting these past few nights. The house is overgrown, with

the woods recycling floors, studs and sidings. Insects smash themselves into the HMI's, producing the aroma of seared moths. A number of men in the crew are carrying sidearms to defend themselves against a sudden Rottweiler attack, or the snakes in the kudzu. The leafy kudzu was imported here from Japan to prevent soil erosion, and now the kudzu is taking over—and snakes like to hang out in the kudzu.

ROTTWEILER is about a fierce pack of specially bred and trained dogs who get away from the army base where they are kept. These creatures have developed super intelligence and a hatred for humanity. The dogs go on a rampage and decimate the population of an out-of-the-

way town. Much of the story revolves around the misguided scientist, played by Josh Gamble, who trained the dogs, and his efforts to save them from the true-grit sheriff, played by producer Owensby.

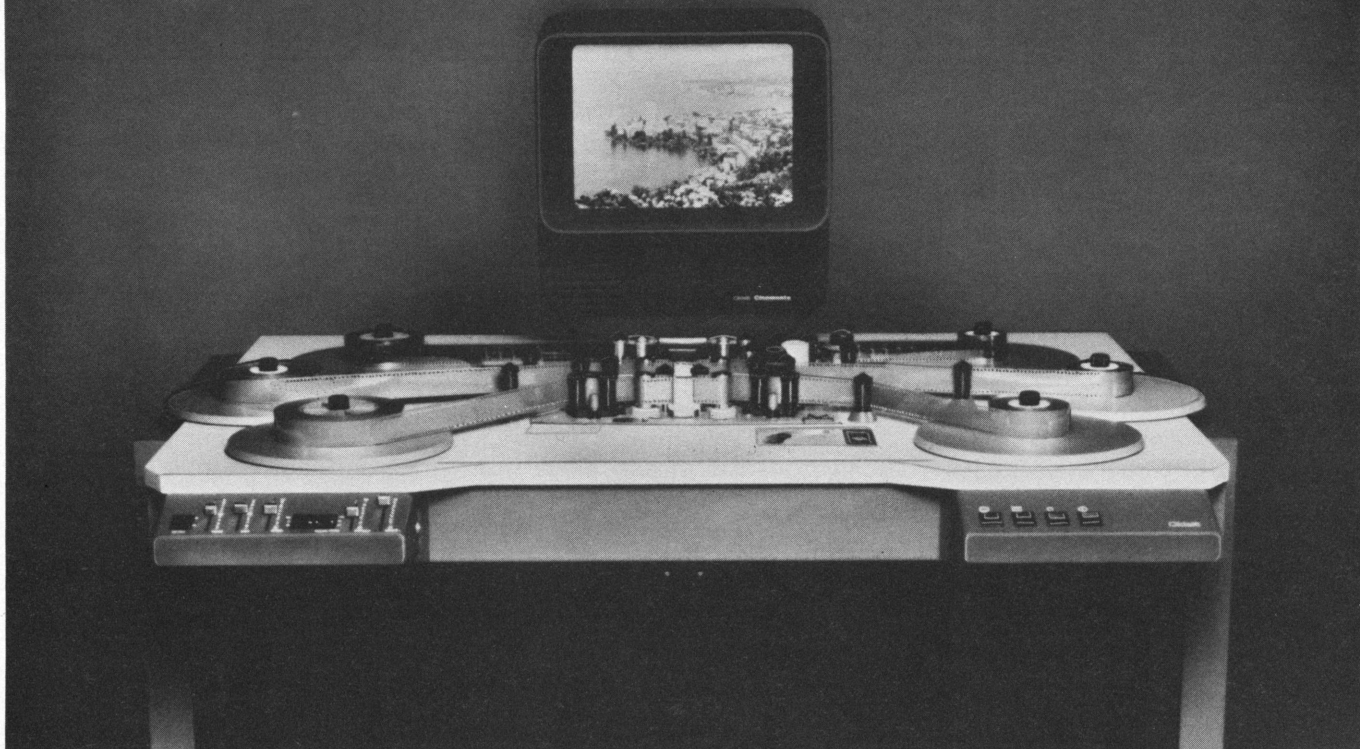
Practically all of the film was shot night-for-night, because the production company wanted an authentic and atmospheric look. Of course this added greatly to production difficulties, especially when large areas had to be illuminated or when equipment had to be carried into locations over difficult terrain.

We also had our problems with the dogs, who often would not perform as planned, or even hit their marks. I can honestly say that Stereographics Corp.'s three-dimensional technology

Producer Earl Owensby in costume for his role as the sheriff rehearses a 3-D effect with a gun barrel. Owensby, who has his own studio in North Carolina, was one of the first producers to take advantage of the recent advances in 3-D technology.



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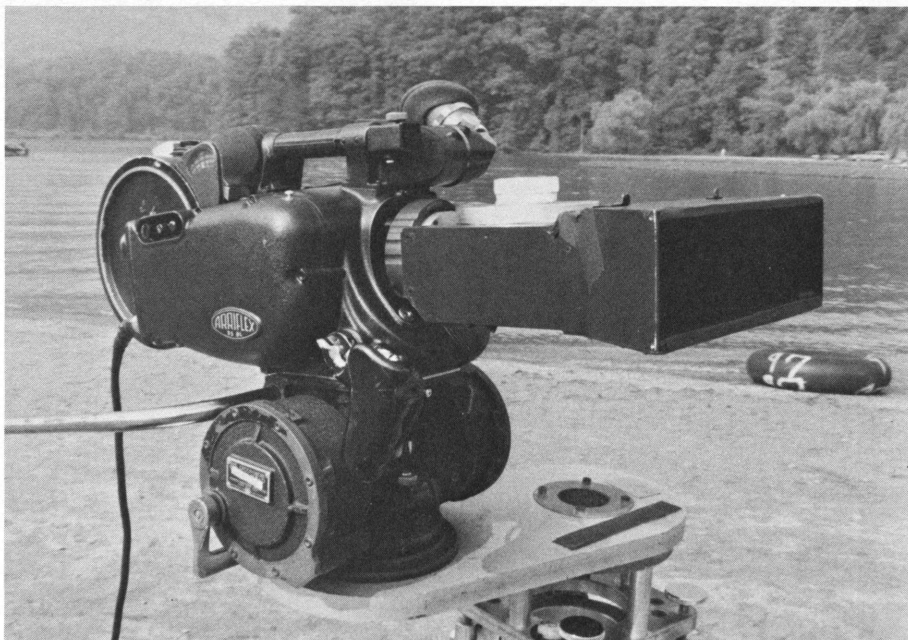
itself only rarely added to our troubles, and setups were made at practically the same rate as shooting flat photography.

The system we used on this picture employs optics which form two adjacent techniscope-style frames, each two perfs high with left and right images above and below each other on a single piece of 35mm film, producing a 2.35:1 aspect ratio picture without anamorphics. Unlike older three-dimensional systems, which relied on two interlocked cameras to photograph the necessary left and right perspective view points, this system does it all with a single camera. A reflex camera is turned into a stereoscopic camera simply by adding the over-and-under optics, which are presently available in BNCR mounts. We can also provide them in a "neutral mount" so that they may be adapted by Panavision for their equipment.

Projection is accomplished by replacing the existing projection lens with a three-dimensional projection lens. The lens superimposes the left and right frames and polarizes them so that when the audience members wear the special polarizing glasses they can see a true three-dimensional image.

Lenses for the production and for exhibition are manufactured by Stereovision International of Burbank, and were designed by Chris Condon. Stereographics Corp. of Point Richmond, California, quality-controls the camera lenses and provides the technical expertise for using the optics and a series of proprietary inventions to enhance the system. Condon began design work on the over-and-under optics in 1977, the year after I began my systematic study of that obscure branch of human knowledge, stereoscopic imaging. Our companies joined forces to service the E.O. Corp. with a systems approach to three-dimensional cinematography, by providing the finest lenses and the best possible technical backup. The heart of our system is quality control.

It was Stereographics' responsibility to make sure that the ROTTWEILER photography looked good, and would feel good to look at, too. In addition, I was called upon to use the medium for the kinds of three-dimensional gimmicks that people love. If objects and people don't come poking, flying, or hurtling out of the screen, spectators feel they haven't got their money's worth. Strictly be-



Stereovision 3-D lens mounted on an Arriflex for photography of ROTTWEILER. Lenses used during production included 20mm, 24mm, 32mm and 60mm focal lengths.

tween us, any three-dimensional system can thrust things out into the theater. The greatest challenge in the art is producing photography that is pleasant to look at for the duration of a feature film, even when guns, dogs, bloody hands, and people tear out of the screen.

Fortunately, Worth Keeter III, the director of ROTTWEILER, has a good appreciation of the medium and used a moderate approach. We had an opportunity to shoot tests together prior to production, and I gave Worth a manuscript copy of my new book *Foundations of the Stereoscopic Cinema*. His use of what we call *theater space* effects was right on. Only when it made sense in the context of the action did objects emerge from the screen. It's like this: If you're running a sound track at full volume, how do you make it louder when it needs to get louder? Similarly, restraint needs to be applied to strong three-dimensional effects.

Credit for the fine photographic work must also be shared by cinematographer Irl Dixon, his camera assistant Roger Painter, gaffer Dennis Woods, key grip Fritz Goforth, and the contribution of the entire E.O. production team, especially dolly grip Gene Pool. A lot of the film uses a moving camera to enhance the stereoscopic effect, and Gene did a great job keeping it moving smoothly.

The set of lenses used on ROTTWEILER consisted of a 24mm lens, used in the first few weeks of photog-

raphy, which was replaced by a 20mm lens of advanced design. Also used was a 32mm lens, and in the last days of photography a 60mm lens became available. These lenses focus and converge to about three feet, and current production models have a speed of T/4. The lenses are very sharp and well-corrected.

Most of the photography was done with the 20mm lens, which produced the finest three-dimensional effects even when used on the crane looking out and down at cars and buildings 40 or 60 feet away. This lens also gave pleasing closeups, over-the-shoulder shots, and two-shots, because of its great depth range.

When working as stereographer in the last few months, I quickly learned that social skills are as important as technical ones. The stereographer must keep a low profile and provide all possible encouragement, as the crew enters what, for them, is uncharted water. The stereographer works as part of the camera crew, in conjunction with the director, director of cinematography, operator, and gaffer, and is involved in the creation of each setup. Sometimes the most routine-seeming shots provide the greatest challenge, and shots which appear to be impossible turn out to be simple to do from the stereographer's point of view.

In terms of instrumentation, the most notable difference between our stereoscopic lenses and the usual planar lenses is the addition of the

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convergence control. The convergence setting functions to align the optical axes of the lenses so that the stereographer can control the placement of objects in three-dimensional space. At the time of photography we can decide what will appear at the plane of the screen in projection, and what will appear in front of or behind the plane of the screen.

The only time the new technology slowed us down a little was when we were going for special theater space effects, which I felt required bracketing of the convergence control, to insure we had the optimal effect.

The stereographer also has to be familiar with a concept we call depth range, which in some ways is similar to depth of field. For a given lens and how it is set, there is a certain maximum and minimum distance at which objects can be placed to produce the most pleasing and comfortable photography. Although we have computed extensive depth range tables, the stereographer must interpret these tables based on factors such as exposure, focus and composition.

A great many shots required following convergence, especially when dollying in or out. The moving camera is to be encouraged, since it heightens the three-dimensional effect. And I should add that the stereographer must also be something of an expert at perceptual psychology, since the stereoscopic depth cue in and of itself does not provide three-dimensional information. Monocular depth cues, especially perspective, serve to strengthen the stereoscopic effect, and it is the job of the stereographer to help design shots that heighten the photography whenever appropriate.

ROTTWEILER was shot more than a year ago. In that time Stereographics Corp. has continued to develop three-dimensional motion picture technology. We have designed and built a cell animation system to be used on the first animated three-dimensional feature in the history of the cinema. The film will be released by one of the major studios.

Stereographics Corp. has designed and built the first stereoscope system for horizontal editing tables, so that the editor can view in three dimensions while cutting. Editor Lee Percy is the first person to use the editing stereoscope hood, for a Filmlink production. The project, a compilation film of three-dimensional movies made over the years, was edited on a KEM table, but our equipment will

work on other models.

Stereographics Corp., will be offering a stereographic system for 65mm photography, providing two side-by-side 35mm-size frames on a single 65mm piece of film. We think this will give the kind of quality that the film industry demands for opticals, matte work, and for three-dimensional or flat release in 35mm.

Probably the most exciting development is our three-dimensional video system. Although there are many possible applications for the world's first NTSC high-quality flickerless three-dimensional video system, it will work great as a video-assist viewfinder. It will function in conjunction with any 35mm camera with a video tap. No modifications to the camera or existing tap are necessary. At last, cinematographers will be able to see the image stereoscopically at the time of photography, without having to wait for dailies!

The film industry stands on the brink of a technical revolution. It is entirely possible that in the months to come the three-dimensional medium may become an enduring part of the motion picture industry. We at Stereographics Corp. believe we have solved the technical problems. We believe the proof is in the film, and that ROTTWEILER has the best three-dimensional photography seen on the screen. But no matter how perfect our process, in the final analysis the most important factor will be the films using the process. They need to have good scripts, good direction, good cinematography, and good acting. In other words, we need good movies that are also three-dimensional. ■

Lenny Lipton, an independent filmmaker and writer, has just published a book on 3-D entitled Foundations of the Stereoscopic Cinema: A Study in Depth.

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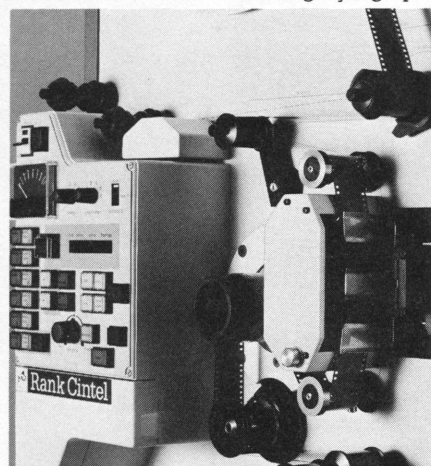
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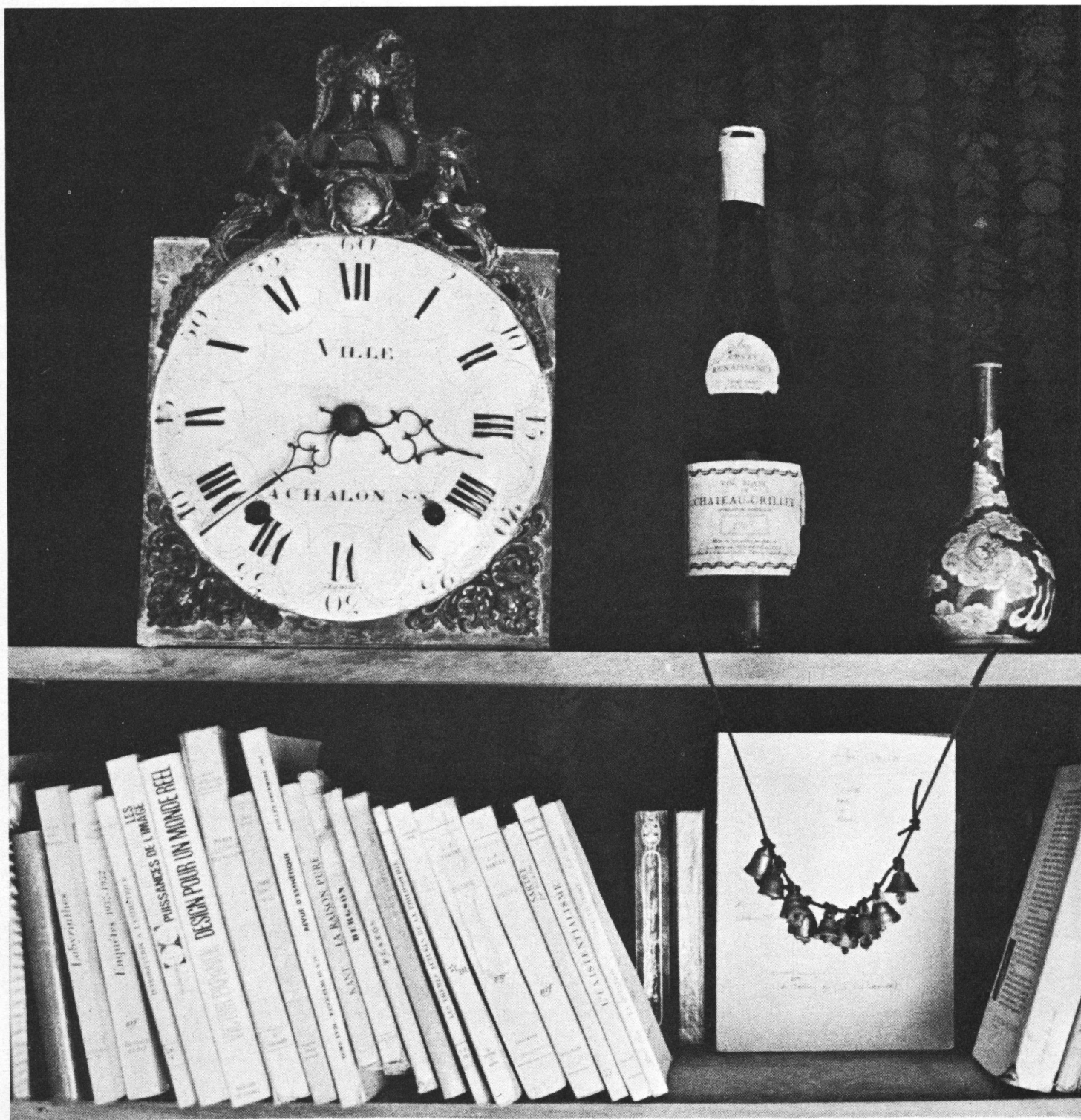
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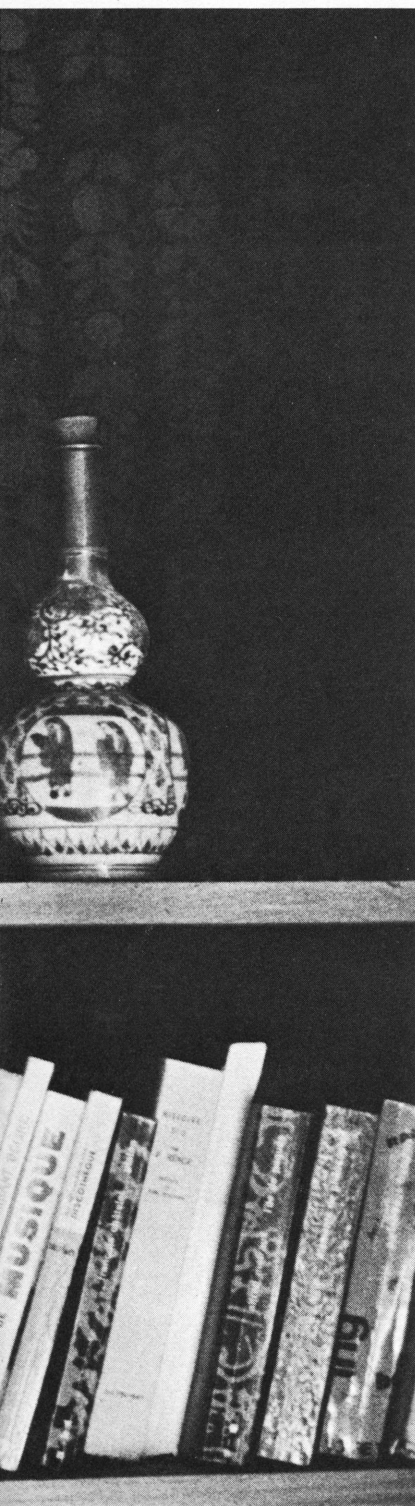
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COVERING THE FALKLANDS

By **BERNARD HSKETH**
as told to **DAVID SAMUELSON**

(Editor's Note: Bernard Hesketh is the highly experienced newsreel cameraman who, together with John Jockel, sound recordist, covered the South Atlantic War (Falkland Islands) for the BBC. He is interviewed here by David Samuelson, himself an ex-Movietone News newsreel cameraman who worked alongside Hesketh at the time he was working for Pathe News, as long ago as 1947.

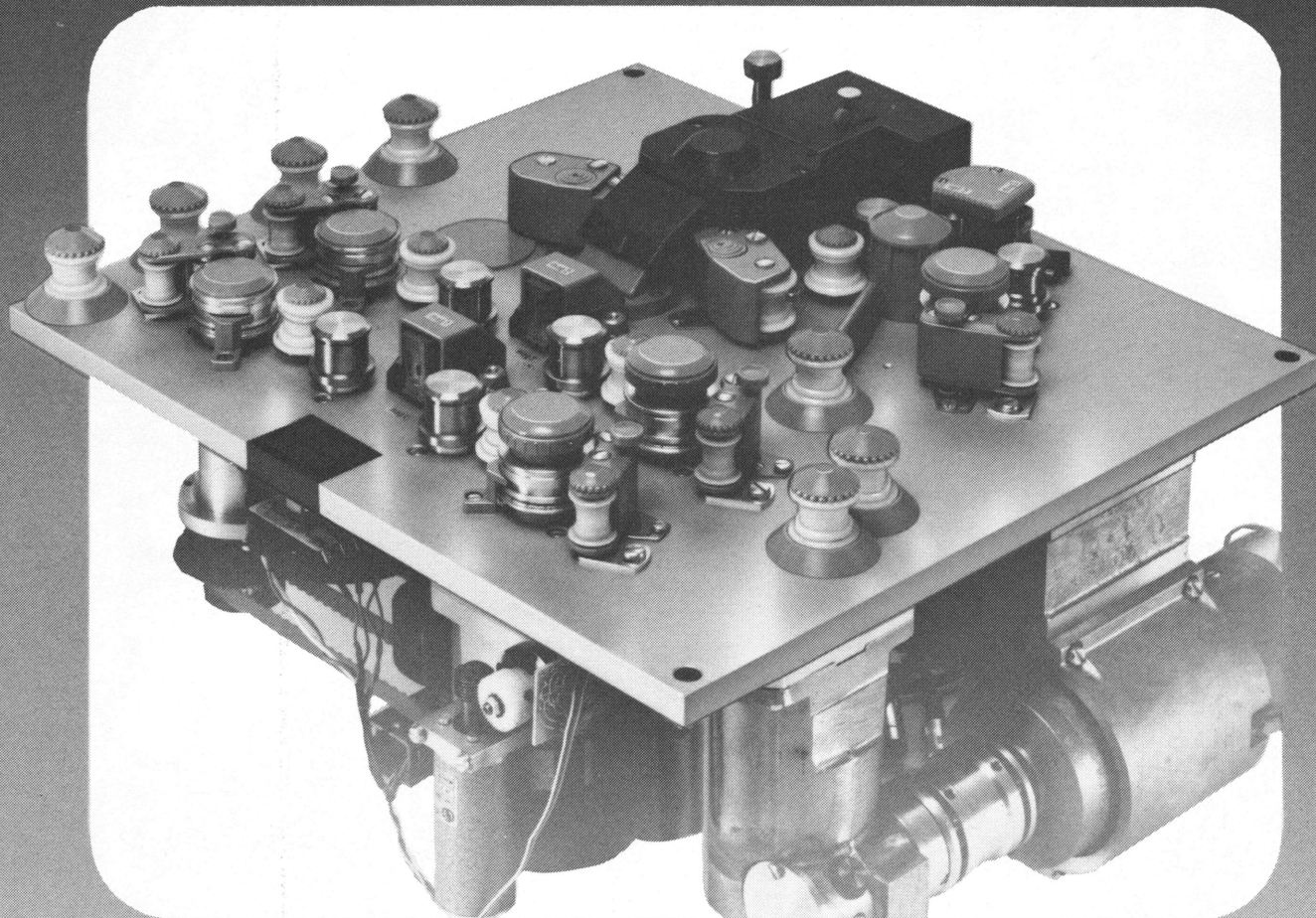
Since I joined the BBC in 1954 I have seen a fair amount of combat. I had a couple of very long trips to Vietnam, covered various aspects of the almost continuous war in the Middle East, Cyprus, both the Eoka campaign and the Turkish-Cypriot war there, six trips to Angola during the civil war there and the withdrawal of the Portuguese forces from there and was wounded covering the Iraq-Iran war. I have spent almost as much time in Northern Ireland as anybody and also covered guerilla warfare in Ethiopia. I think I was the first to go in with the guerillas in the Eritrian mountains fighting against the Ethiopians.

Initially, it was expected that John Jockel and I would fly to Ascension

Bernard Hesketh, news cameraman for the BBC, on the deck of the carrier Hermes during the Falklands War.

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Island and join the Task Force. In other words, we would fly down there about 10 days after the Task Force had left Portsmouth. Literally I had about four hours to prepare on a Sunday afternoon. I had been to my grandson's christening in the morning and had to leave the celebration after the christening in order to get the gear together. First of all we were going to take 525 line NTSC ENG equipment but when we had another think about it and had talked to our engineers and communications boys it was decided it would be better to take 625 line PAL. It was also decided that we would take film. The reason for this was that we knew that the big battle radar, the 996 I think it's called, on the big ships, literally destroys the picture for a period of 2 or 3 seconds about every 10 seconds, so it was quite out of the question to use ENG or electronics or video recordings on the big ships.

I arrived in Portsmouth at about midnight and boarded *Hermes*, and then we set sail. From the very moment we arrived we were aware that the radar was working so we switched to film. Film was really our lifeline once we got into the main combat area, or likely combat area, because a big ship like *Hermes* cannot afford to switch its radar off.

We took a CP16 AR with a built-in recorder together with a BBC separate recorder and a Nagra tape recorder. We took about 60 400 ft. rolls of 7240 and 7250 comag reversal film, and we also took an Ikegami 79D camera and a Sony BVU portable recorder together with about 100 BVU cassettes.

We had no back-up cameras; it's not physically possible to carry any more. With the CP16 I had 7 camera batteries. The great advantage of the CP 16 camera battery is that with the modified charger we can charge the battery from an ordinary motor car battery, from a 12 volt supply. In almost any war situation you can think of you can get to a motor car or a truck or a vehicle which will have a battery.

ENG battery charging equipment is considerably bigger and, because the amount of current required to charge a battery is that much greater, it is not possible to do it off a motor car battery, which is a problem. We took four camera batteries and seven batteries for the BVU re-recorder. The reason we took more for the BVU was that you can feed your camera from the



Hesketh and sound recordist John Jockel shooting on board the *Hermes*. Hesketh took both a CP 16 film camera and an Ikegami 79D video camera. Radar created interference which destroyed the video picture for about 2 or 3 seconds out of every ten in some areas of the ship.

BVU, so if you are going to have more batteries it's better to take recorder batteries, not camera batteries. When we were in the Falklands we used to keep the battery charger at the Brigade or Battalion Headquarters where they usually had a signals unit that had a 230 or a 110 volt supply. We also found 230 volts in some of the small settlements, where they had a local generator. In Fitzroy, for example, we kept the charger in the house of the Falkland Island company manager and could go back by helicopter there from the front line area to charge batteries. We also had tripods, but tripods are too heavy and too vulnerable to carry around in a front line situation. Everything unfortunately had to be hand held. I often wished I'd had a tripod when I was on top of a mountain.

The lens on the Ikegami ENG camera has a doubler, built into the lens so that you can go from 117mm to 234mm by the flick of a switch. In fact, where I could get something to support the camera I used the doubler, but really you can't hand hold it. One of the problems on the Falklands Islands is that there's always a very high wind, always which makes keeping a camera steady very difficult. Try as you will, even on a wide angle it's very difficult.

Only when the main radar was off could we use the ENG camera. The radar beam itself would literally destroy the picture. It even caused an interference on the sound channel of the CP16, so almost wherever we

went we had this problem. But at least on film it didn't destroy the picture.

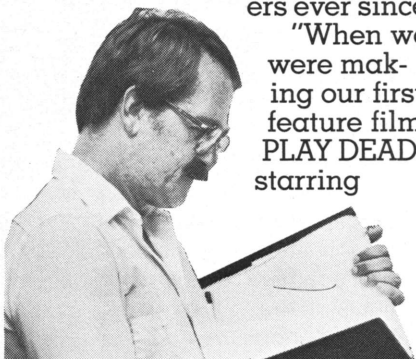
On the way out, because we were in a fairly safe zone six or seven thousand miles away from the Falkland Islands, we could ask for the battle radar to be switched off. Sometimes it wasn't working, so during those periods we could use ENG. We did coverage for the documentaries we knew that the BBC were going to make. We didn't know what length or what shape it would be, because we didn't even know what sort of coverage we were going to get. But we knew they wanted to do this so we set about providing the material for a documentary, and also providing material for news bulletin coverage. We did as much of that as we could on ENG, on electronic, on the way down because we could persuade the officer of the ship to switch the radar off. When we were below decks, of course, we weren't troubled by radar, it was only when we were on the open decks that it caused a problem. We could find some places on the open deck where we were screened, but if a helicopter came up alongside, the radar signal would be reflected off the helicopter and that would give us trouble. Generally speaking on our way down to the Ascension Islands when we wanted the radar off and the Harriers were not flying we could get it off. So most of our initial coverage was done on ENG. In fact during that period I think we shot something in the order of 15 tapes, that's 15 to 20

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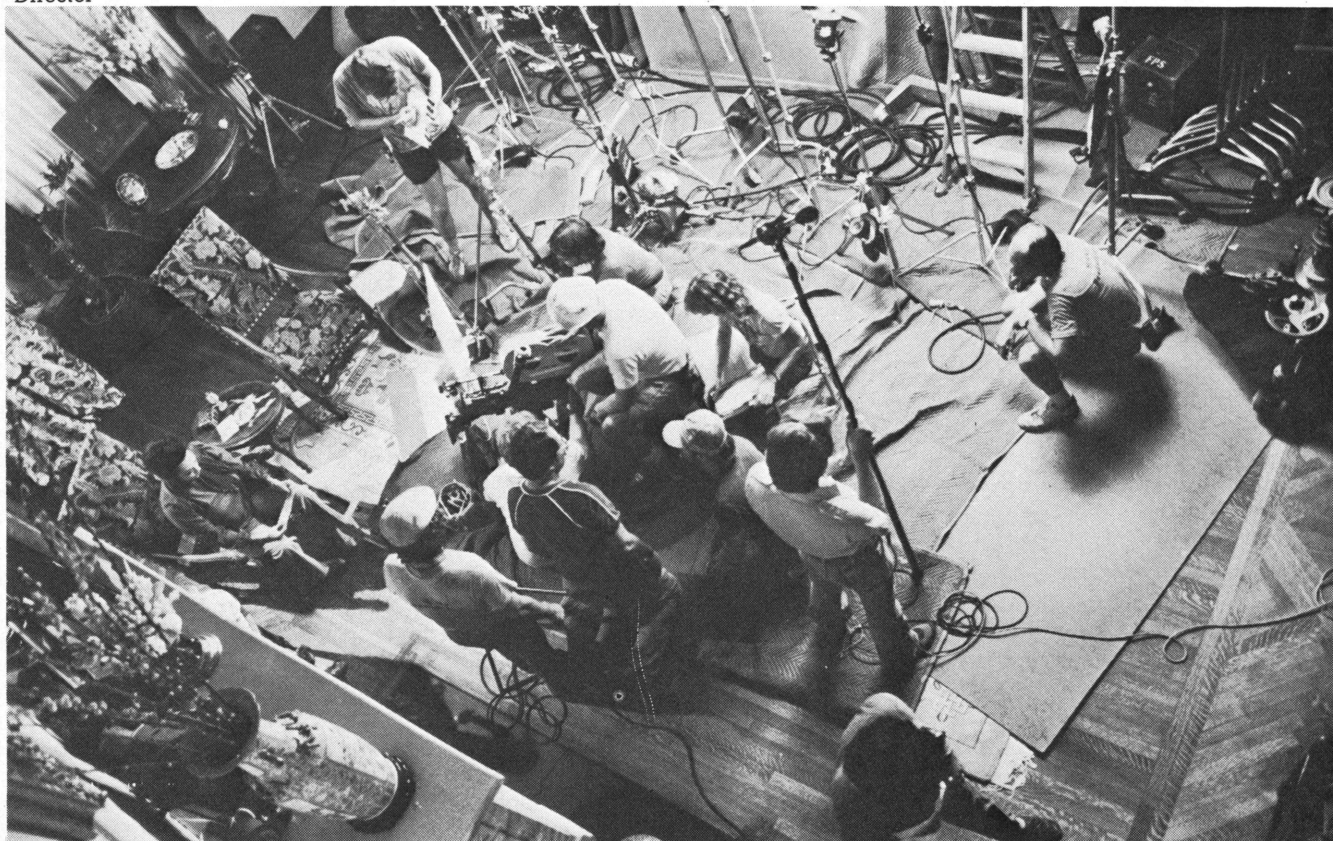
back to New York to TVC's post production team for the opticals and cutting the negatives. The

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Setting up a shot for Play Dead

minutes of material which was a mixture of news coverage and the coverage for our documentary. From this material we in fact made four 15 minute programs for the ship's closed circuit television. We did a rough edit ourselves on the ship, scripted it, and provided this little service for the ship's crew, which they enjoyed enormously. It was a PR exercise on our part, to win them over to us, to make them realize that we were there to help them and in no way jeopardise their lives. We were treated with a certain amount of suspicion initially, but I think generally we won them over to us.

We couldn't process film on board. We could view our video. In fact, when we left Portsmouth, ITN had put what they call a 'feedpack' on the ship which incorporates a time base corrector and all the equipment that is needed to feed the pictures back if in fact we could have used the ship's satellite facilities.

I was on the only cameraman in the whole of the Task Force on a naval ship. ITN had a cameraman on the *Canberra*, a civilian ship which was used to transport a substantial number of troops down to the Falklands, but unfortunately, by the very nature of the ship itself and the facilities on board, his coverage would necessarily be limited. There was not very much he could do, whereas we were flying Harriers every day, we were flying helicopters every day, the helicopters were shifting stores and equipment from one ship to another and in fact it was a constant procession of flying. It was some of the most concentrated flying, probably, in the history of naval warfare.

The thought was that we could use a particular military satellite called SCOT, which means Satellite Communications Ocean Terminal, but being a military satellite we knew very little about its parameters because they're not prepared to tell us—understandably, I support. But what we were told on the ship was that it had the band width to be able to accept a black and white television picture, which we could then transmit back to the UK. But it meant a willingness on the part of the Ministry of Defence in London to make the satellite available to us. Because we didn't know the parameters we weren't really sure that it would work although the Royal Naval engineers on board thought that it would and we all worked very hard at trying to persuade the Minis-



Carrying all their gear on their backs, Hesketh and Jockel followed the action on land after the invasion. With the video camera it was necessary to return to headquarters periodically to recharge the batteries with 230 or 110 volt current.

try of Defence to allow us to do tests on the way down to Ascension when the demand on the ordinary communications was less than it would be once we got to the war zone. They refused to allow us to make our tests, saying that HMS *Hermes* was the command ship, and all their important signals went through the SCOT system, and in no way could they switch it off or make it available to us because it would mean that they would then virtually be out of touch, and they couldn't afford this.

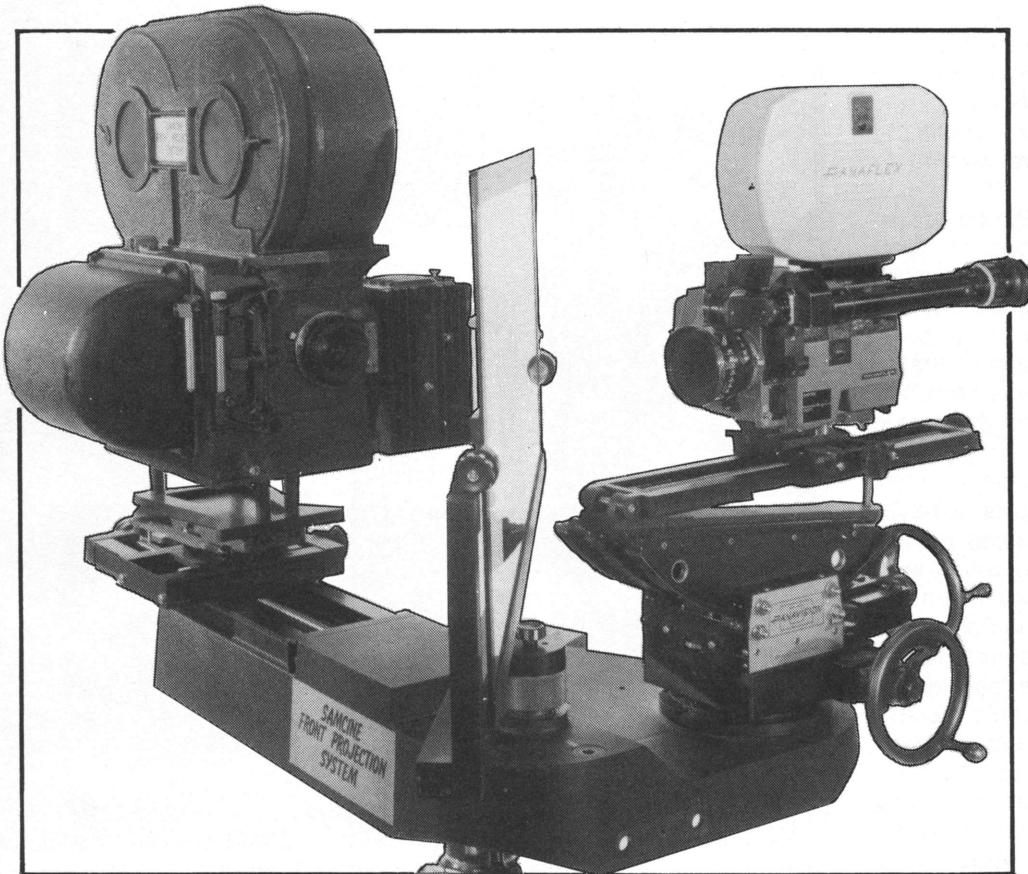
There was another possibility: a virtually spent American satellite which is not in stationary orbit with the earth but which is moving very slightly, half a degree a day or week, which we thought we might be able to use, but its attitude was not correct to receive our picture. If we could have persuaded the Americans to al-

ter the attitude of that satellite we could have fed through them, but apparently the Americans would only agree to do this if the Minister of Defence were to make the request for it to happen. But the Minister of Defence was not prepared to make that request. What it meant, in fact, was that all the pictures we took had to go back by sea. They would take anything up to three weeks to get back to the UK, and for newsmen these days that's a tragedy.

In Vietnam, back in the late 60's, early 70's, we would shoot the story one day and it would be on the screen in London the next day. It took 3 weeks in 1982. An example was in Fitzroy, with the ship *Sir Galahad*, while I was shooting that, subconsciously I knew that everything I shot that day would take at least two

continued on page 1075

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The Art of

Unique is the word for an art show which brought a record number of viewers to the ARCO Center for Visual Art in Los Angeles during July, August and September.

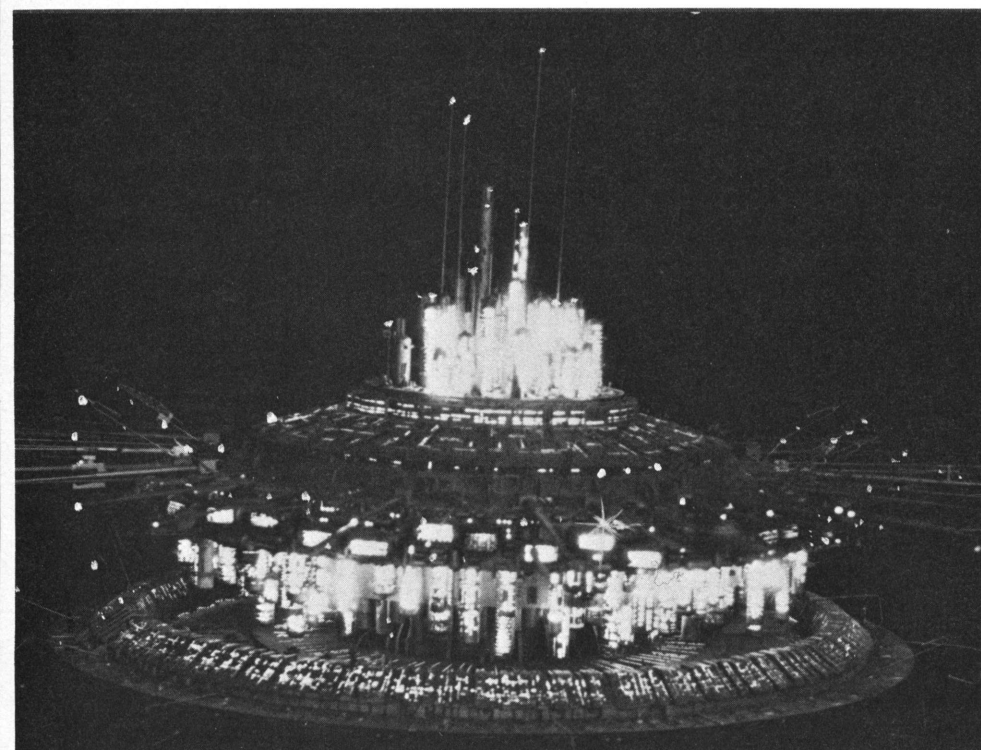
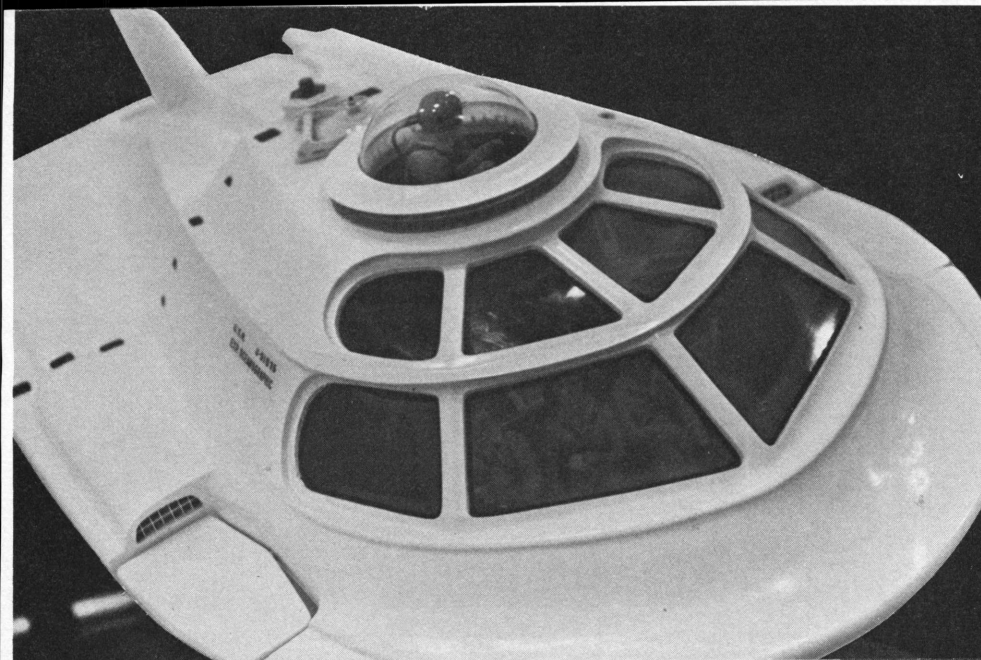
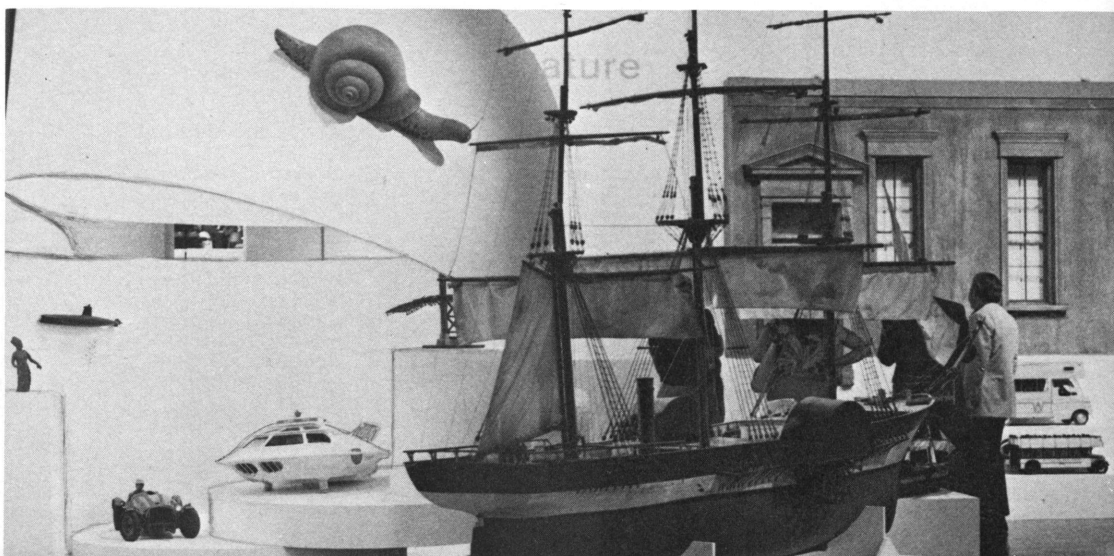
On display were 50-odd examples of work by artists who specialize in the creation of miniatures and scale models for use in motion pictures. The items ranged from artifacts made 50 years ago for the still popular KING KONG to 1982's BLADE RUNNER and ONE FROM THE HEART.

Although little publicity preceded the show, ARCO Center Curator Fritz A. Frauchiger said that more than twice as many visitors came to the gallery as had attended any previous show there. Seemingly, they were undaunted by a Los Angeles *Times* review which chided the works for a collective lack of "aesthetic resonance."

The largest item on display was a three-masted sailing ship, 15 feet in length, which was used in several Walt Disney features, the most recent being PETE'S DRAGON (1977). The smallest is the tooled metal head of a snake-like marine reptile, elasmosaurus, which fought the giant ape hero of KING KONG (1933). Only two inches long, the head has fiercely lifelike eyes and a movable jaw studded with sharp, metal teeth.

Kong himself is represented in skeletal form—an intricately tooled armature made of dural with steel joints. This model is 21 inches high, three inches taller than several other work-

(TOP) Submarine *Proteus* from *FANTASTIC VOYAGE* is 60 inches long and contains figures of Raquel Welch and other cast members. (CENTER) The amazingly detailed Mother Ship from *CLOSE ENCOUNTERS OF THE THIRD KIND*, 68 inches in diameter, by Ralph McQuarrie, Larry Albright, Greg Jein, Davy Jones and Peter Anderson. (BOTTOM) Part of the exhibit hall. The giant snail is from *DR. DOOLITTLE*, the ship a veteran of several Disney features.



the Movie Miniature

by MIKE MAGINOT and GEORGE TURNER

ing models used in the film. A left foot from another Kong is about the size of a baby's hand and still has foam rubber "flesh" clinging to it. Even more intricate is the armature of MIGHTY JOE YOUNG (1949), a later giant ape designed by the creators of Kong, Willis O'Brien and Marcel Delgado. These models were made for animation, to be set into firm positions and photographed one frame per position, 24 separate photos being necessary to yield one second of screen time.

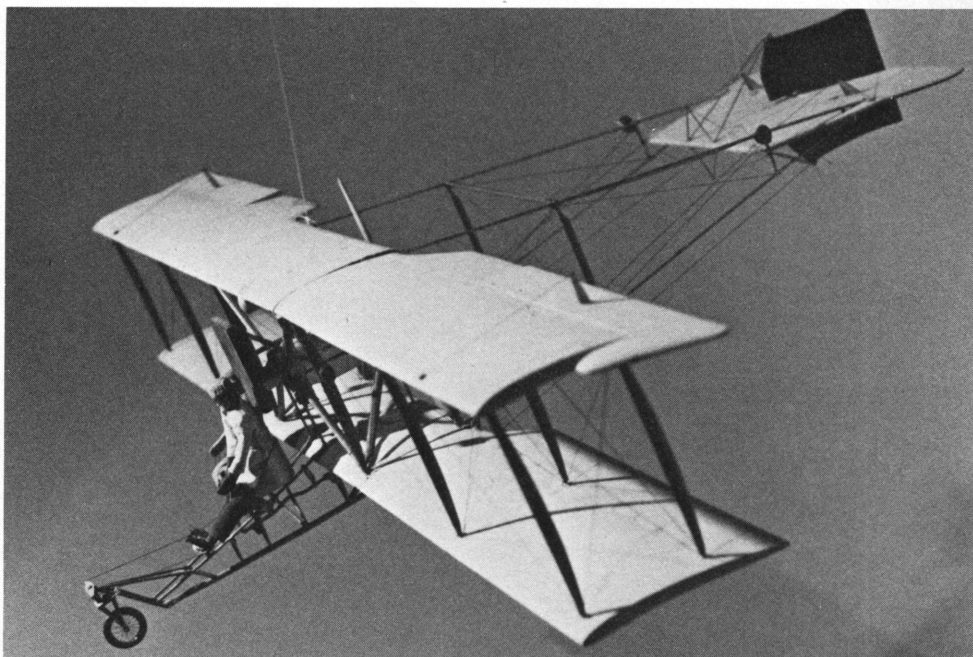
Other notable animation models shown were by Ray Harryhausen, including a flying saucer and the shattered dome of the U. S. Capitol Building from EARTH VS. THE FLYING SAUCERS (1956), and the sinister ship's figurehead which comes to life in THE GOLDEN VOYAGE OF SINBAD (1973), which is made of metal and appears to be a weathered wood carving. A chasmosaurus by Jim Danforth for WHEN DINOSAURS RULED THE EARTH (1971) is amazingly life-like, though only 22 inches long.

Among the unusual "flying objects" shown were the Curtis Biplane from CAPTAIN EDDIE (1945), a Spitfire and a JU-87 Stuka from A YANK IN THE R.A.F. (1941), a MIG-21 from ICE STATION ZEBRA (1968), and assorted space craft from BUCK ROGERS (1980), BATTLESTAR GALACTICA (1979), METEOR (1978), LASERBLAST (1978), DARK STAR (1972), FLESH GORDON (1972) and

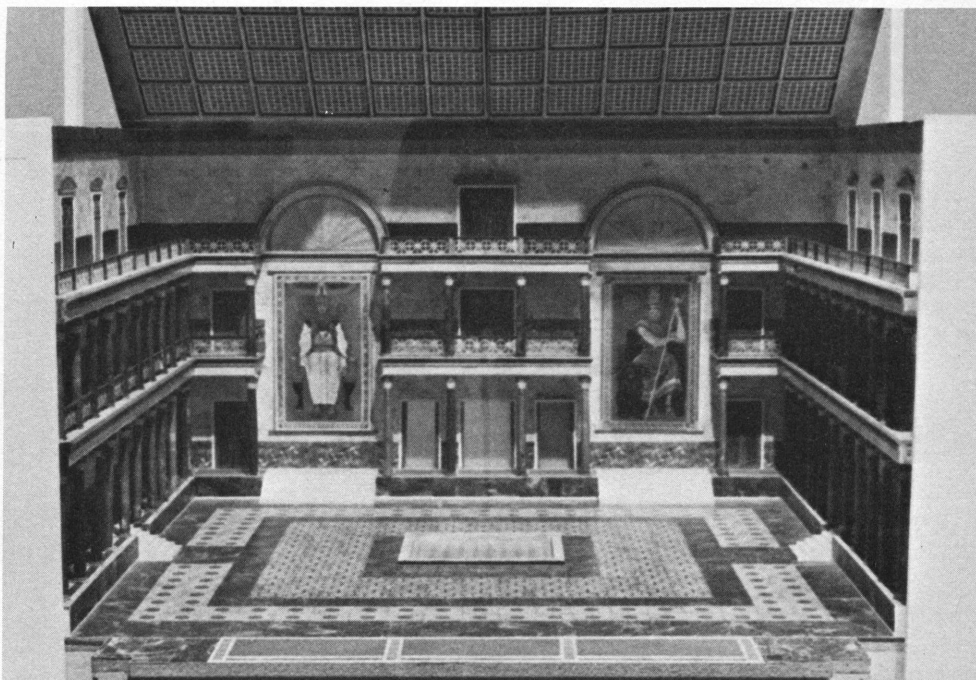
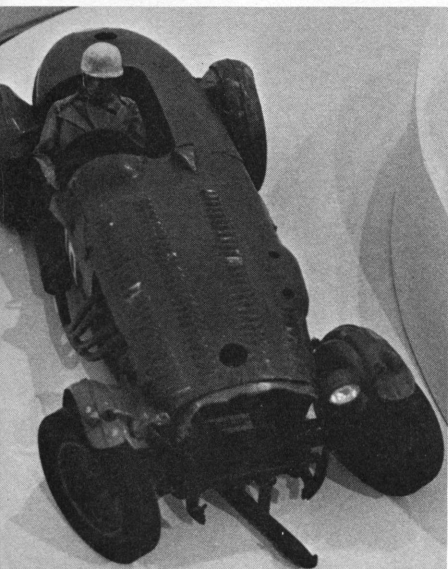
CLOSE ENCOUNTERS OF THE THIRD KIND (1977). The most spectacular is the Mother Ship, from CLOSE ENCOUNTERS, which was borrowed for the exhibit from the Smithsonian Institution.

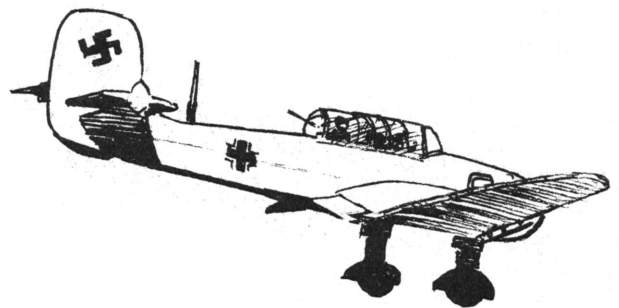
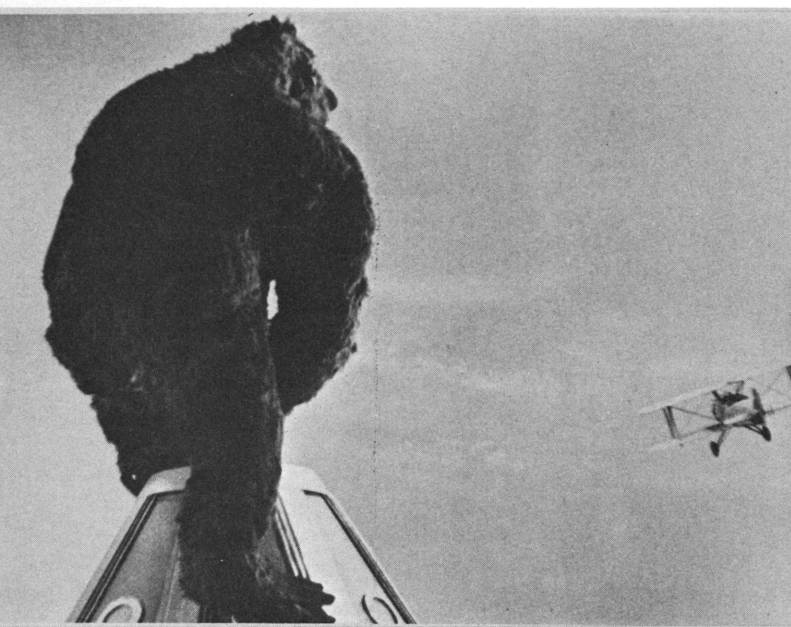
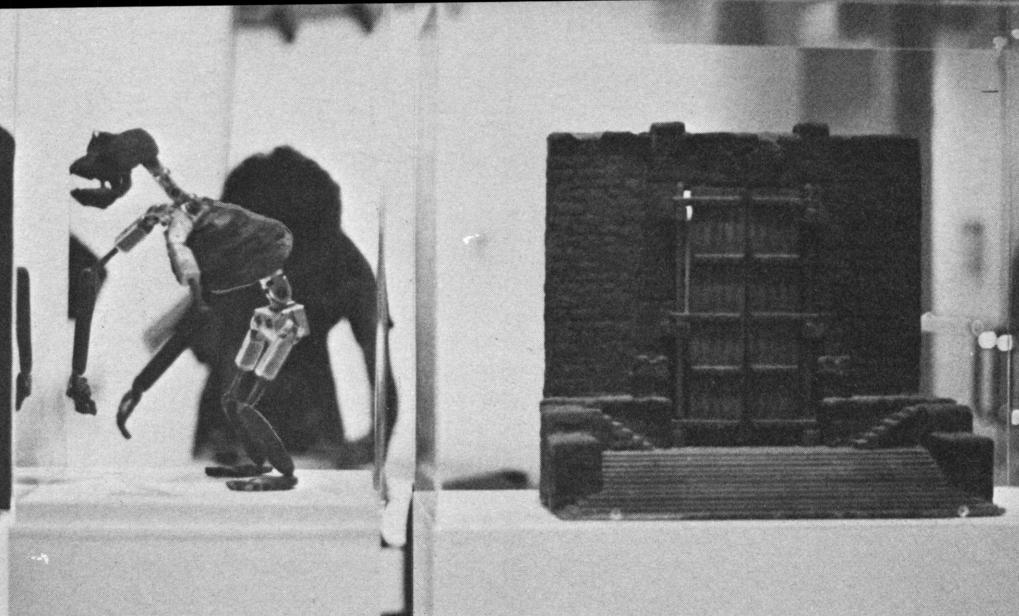
Other titles represented include COSMOS (1980), ALIEN (1979), THE BLACK HOLE (1979), ESCAPE TO WITCH MOUNTAIN (1975), TORA!

TORA! TORA! (1970), DOCTOR DOOLITTLE (1967), THE RACERS (1955), THE DANCING MASTERS (1943), IT CAME FROM BENEATH THE SEA (1955), and THE GREAT RACE (1965). Miniature builders Greg Jein, Larry Albright and Nora Lee repaired and relighted many of the exhibits. John DeCuir Jr. headed the design staff. ■

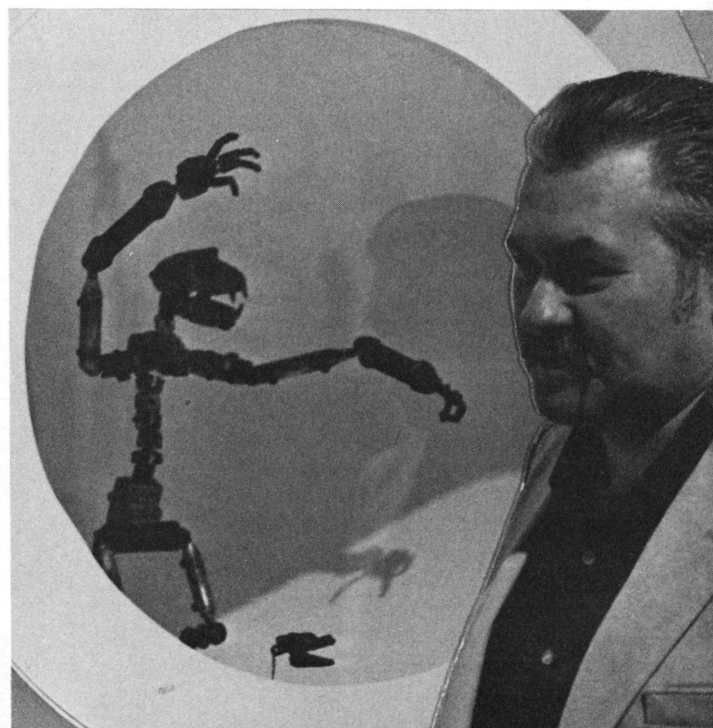
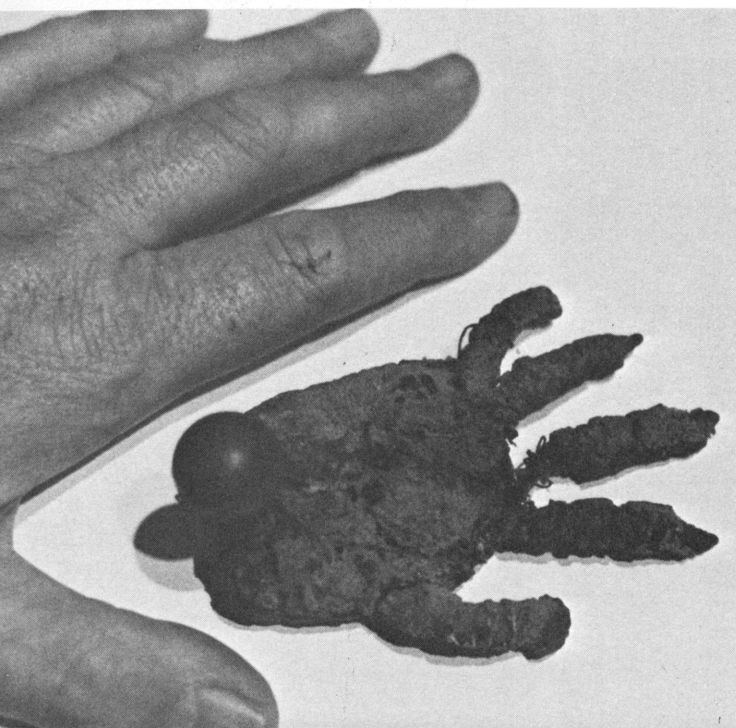


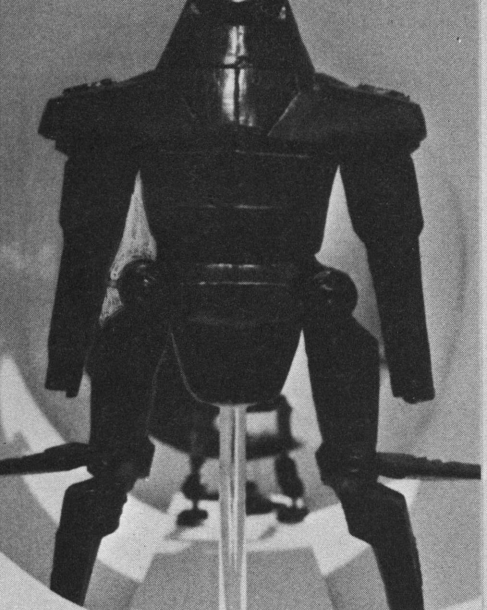
(ABOVE) Curtis Biplane supposedly flown by Fred MacMurray in CAPTAIN EDDIE has a 60 inch wing span. (BELOW LEFT) Racing car, 44 inches long, figured in a spectacular crash in THE RACERS. (BELOW RIGHT) Alexandrian Library main hall from the TV series, COSMOS, is 66 inches wide.



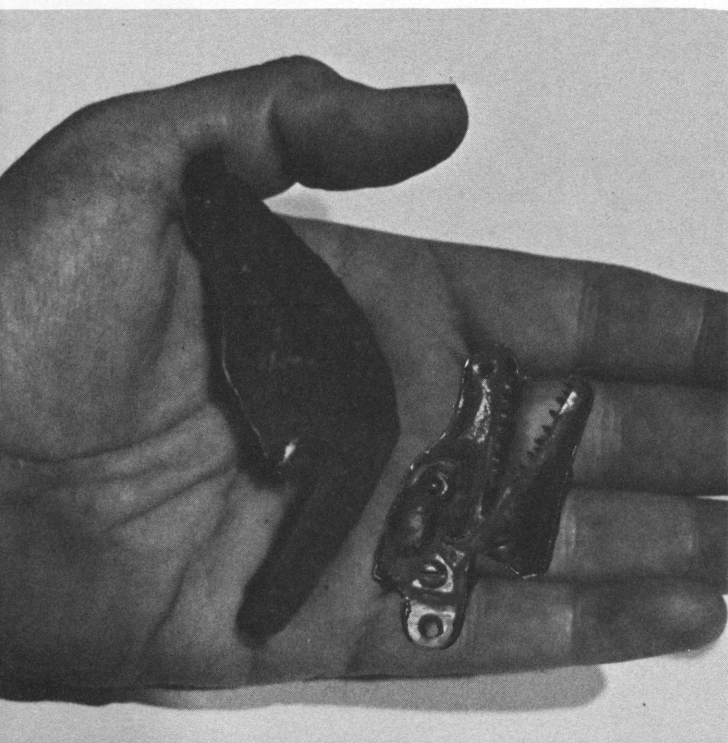
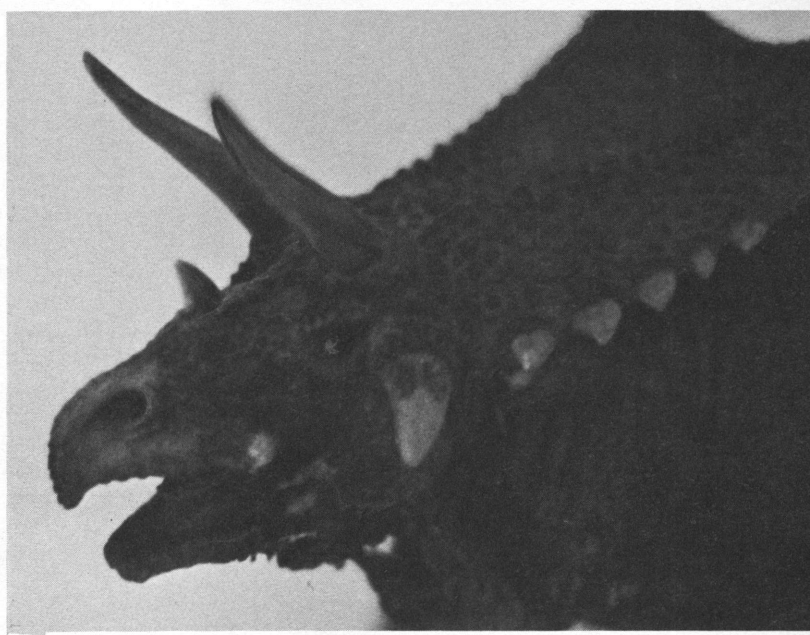


(ABOVE LEFT) MIGHTY JOE YOUNG armature, 10 inches tall, and an art director's model of the Great Wall from KING KONG are dwarfed by onlookers. (ABOVE RIGHT) Flying saucer and the 19-inch dome of the U. S. Capitol Building were designed by Ray Harryhausen for EARTH VS. THE FLYING SAUCERS. (LEFT) The title character of KING KONG as he appeared in the movie. (BELOW LEFT) Left foot of one of the several models of King Kong. (BELOW RIGHT) Only the armature remains of the 21-inch model of Kong used in the New York sequences. Bob Burns, movie gorilla impersonator, looks fondly at his colleague.





(ABOVE LEFT) Maximilian, robot villain of **THE BLACK HOLE**, is 19 inches high. (ABOVE RIGHT) Metal "skull" of the ape, **MIGHTY JOE YOUNG**. Joe, who appeared 10 feet tall in the movie, is actually 10 inches tall. (RIGHT) Horned dinosaur, chasmosaurus, of **WHEN DINOSAURS RULED THE EARTH**, appears lifelike despite deterioration of rubber hide. (BELOW LEFT) Smallest artifacts in the show are the head and a flipper from the prehistoric elasmosaurus of **KING KONG**. (BELOW RIGHT) Frame enlargement from the film shows the elasmosaurus reaching for Fay Wray, who was projected into the set.





A Hollywood

by GEORGE E. TURNER

Karl Brown's life is the story of motion pictures in Hollywood. He was a film technician in the future film capital years before the arrival of Griffith, Ince, DeMille or Laemmle. He helped assure *THE BIRTH OF A NATION*, made that historic trek with *THE COVERED WAGON*, put the weatherbeaten face of America on screen in *STARK LOVE*, and gave such film staples as mad scientists and slick gamblers a touch of class.

"A whole life," says Karl Brown, "is one massive lap-dissolve." He has put many of the dissolving cuts from his own life into words as, at the age of 85, he continues to practice the work he most enjoys: writing. His witty, penetrating writings have been appearing for more than 60 years, but he is equally noteworthy for his contributions to cinematography, special visual effects and film direction.

None of which, he has demonstrated, was taken very seriously. He enjoyed cinematography—but dropped it after one political hassle too many. He hated directing—and dropped out of the game when he could do so gracefully. He even stopped writing for a time, having succeeded in achieving what he thought he wanted: "obscurity on a comfortable income." A dozen years ago he returned to the typewriter to produce *ADVENTURES WITH D. W. GRIFFITH*, an important book of film history published in 1973, and he has written a great deal since.

Brown was born in Pennsylvania in 1897. His parents were stage and screen performers. He went to work as a general assistant at the Kinemacolor Company's New York laboratory in the spring of 1912. Kinemacolor was the first successful producer of natural color movies. After a year, he was placed in full charge of negative processing. When the studio moved to Hollywood, taking over the Harry Revier lot in 1913, he and his parents came with it. Some months later, Kinemacolor went broke and closed its studio at 4500 Sunset Blvd.

Small studios were moving into the area, the beginnings of a West Coast film industry. The Browns decided to remain. Buying a battered view camera at a Main Street hock shop, Karl set up a darkroom in a clothes closet and got a job shooting stills for cinematographer Alvin Wyckoff for Col. Selig's production, *THE SPOILERS* (1914). His photos of the celebrated fight between William Farnum and Thomas Santschi have been published widely. However, there were no more jobs available.

When the Browns learned that D. W. Griffith and his company were moving from New York to make pictures at the former Kinemacolor studio, they watched and waited. Karl—age 16—managed to talk Griffith's famed cinematographer, G. W. "Billy" Bitzer, into giving him a job as camera assistant. "All I require of an assistant is a strong back and a weak mind," Bitzer told him, and proceeded to prove it.

After much fast and furious flunky work, Brown began shooting

Karl Brown on location in the Smoky Mountains in 1927. The .45 strapped to his hip was necessary for protection against marauding wild boars.

Saga: KARL BROWN



(ABOVE) Living it up on Sunset Boulevard in 1916: a Babylonian orgy on the gigantic set of *INTOLERANCE*. (RIGHT) the opening scene of *BIRTH OF A NATION*, illustrating the introduction of African slaves in America.

inserts and special effects scenes for Griffith—including the allegorical sequences for *THE AVENGING CONSCIENCE* (1914), which still excite the film scholars. He assisted Bitzer on the monumental *THE BIRTH OF A NATION* (1915) and *INTOLERANCE* (1916), probably the two most famous silent films ever made.

After two years of assisting Bitzer, Brown was placed in charge of "the department of experimentation," which was Griffith's eloquent title for the place where special effects and inserts were photographed. Under a four-year personal contract to Griffith he created special effects for all Griffith productions until 1920. One was the pioneering science-fiction film, *THE FLYING TORPEDO* (1916), in which

guided missiles destroy cities—a fantastic idea at the time. For the immortal *BROKEN BLOSSOMS* (1919) he made the beautiful miniature shot of the Limehouse dock area which opens the picture. By a double printing technique he gave Howard Gaye as Christ a supernatural radiance in *INTOLERANCE*.

After serving in the army during World War I, Brown returned to finish his contract with Griffith. When Griffith returned to New York, Brown elected to remain in Hollywood, where he had achieved the exalted status of first cameraman. He joined the Lasky Studio—soon to be renamed Paramount—for which he was director of photography on at least 28 features during the next six years. In many instances he performed double-duty by creating special visual effects, and in several cases he was an unbilled collaborator on stories and screenplays.

While doing retakes for *INTOLERANCE*, Brown had met a beautiful young actress from Maryland, Edna Mae Cooper. They were married two





Frame enlargements from **THE COVERED WAGON**, photographed in the Snake River Valley.

years later, by which time she had become a well-known player in productions by Lasky and DeMille. She later gained equal fame as an aviatrix, holding the women's world's refueling endurance record and being decorated with the *Merite Aeronautique* by King Carol II of Rumania. The Browns are one of the longest-married couples in the film industry.

At about the same time he became a member of the American Society of Cinematographers, which he served as vice-president in 1924-25. He was also associate editor and a frequent contributor to *AMERICAN CINEMATOPHIL* for about five years. In addition¹ to numerous satirical pieces he wrote a five-part series on lenses of all kinds which became a standard reference work for cinematographers.

Four of Brown's Paramount pictures were directed by a fellow Griffith alumnus, Joseph Henabery. In 1921 he photographed *THE DOLLAR A YEAR MAN* for James Cruze, a teaming which led to 22 other Cruze-Brown collaborations over the next five years.

"The most difficult of these was *ONE GLORIOUS DAY* (1922), with Will Rogers," Brown says. "It was about a little spirit named Ek, played by John Fox, who entered Will's body. To show Ek we had to use an entirely black stage. He was painted with stripes to look like a stick figure and the key points where he had to move were marked with red silk. These shots were double exposed with the normal scenes

of the cast. Much of the time I was on the dark stage, developing tests, timing the moves, rewinding."

The most famous is *THE COVERED WAGON* (1923), an epic Western photographed in the Snake River Valley of Utah and Nevada. Much of it was made during heavy snows. While filming a buffalo hunt, Brown was thrown from the camera wagon when an angry bison attacked the horses. The animal charged toward Brown and was shot down from horseback by Ed Jones, a former Arizona sheriff. The stark simplicity and compositional beauty of

THE COVERED WAGON won for Brown a position among the top screen pictorialists.

BEGGAR ON HORSEBACK (1925) was another film requiring unusual photography. "All the sets for a nightmare sequence were supposedly in mid-air," Brown says. *THE PONY EXPRESS* (1925) was another big-scale Western with Ricardo Cortez and Cruze's wife, Betty Compson. Brown (unbilled) wrote parts of the screenplay. The highlight of the show is a spectacular Indian attack on a Colorado town.



Mrs. Queen, one of the players recruited from among the hill folk for **STARK LOVE**. The "set" is real.



The river crossing in **THE COVERED WAGON**. Two horses drowned in the first attempt.

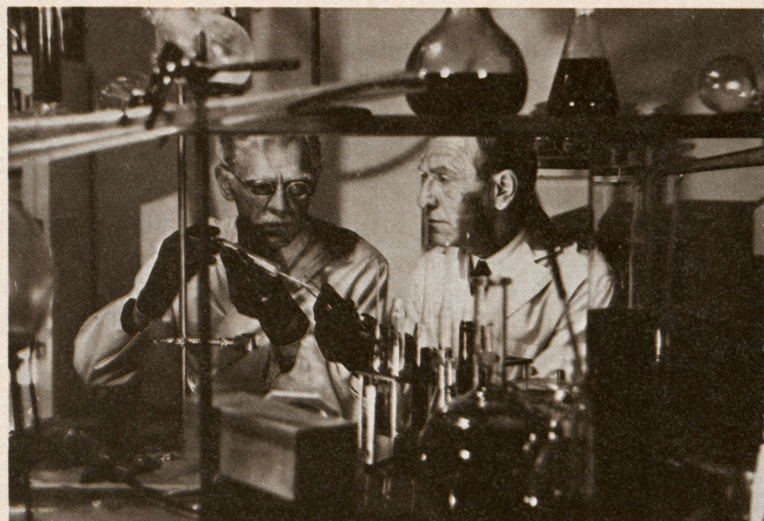
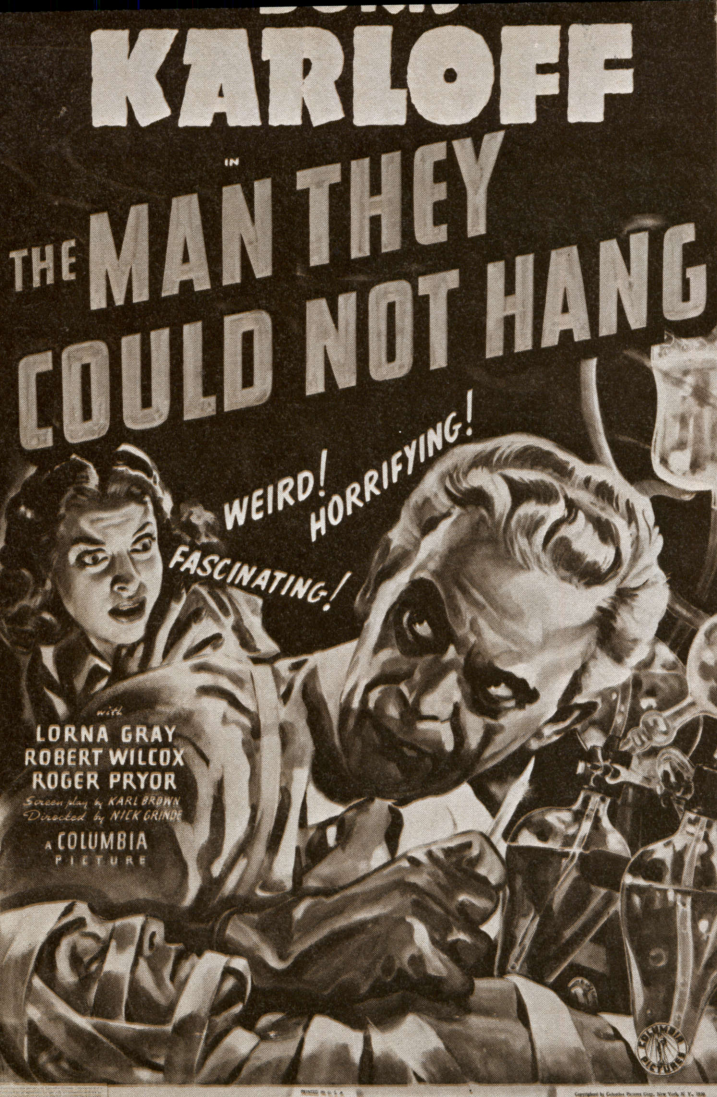
Brown spent most of 1926 producing and directing a remarkable picture: **STARK LOVE**. The lurid title imposed by the studio offers no hint of the picture's stature; it is one of the outstanding silent dramas. Brown had convinced the men in charge of production at Paramount—Jesse Lasky, Adolph Zukor and Walter Wanger—to let him make a picture in the isolated Great Smoky Mountains of North Carolina.

He took a very small company: cameraman Jimmy Murray and Robert Piltack and production manager Capt. Paul Wing. He developed a lighting system for the interiors using acetylene lamps from the helmets of workers in the neighboring coal mines. The entire cast was made up of area people, all of whom earned the same pay: \$25 per day. "That saved a lot of jealousy and quarrels," Brown says. The story, which tells of a boy and girl who struggle to escape the cruelty and superstitious beliefs of the mountaineers, is presented with sensitivity and realism.

"**STARK LOVE** was a year of straight suffering," Brown recalls. "We started in the snow and went through spring, summer and fall. In the summer everybody got what was called 'summer complaint.' It was actually amoebic dysentery. We were equipped with .45s strapped to our belts because of very



(ABOVE RIGHT) a pre-production drawing by Mario Larrinaga for the storm sequence staged in miniature for **CREATION**. (BELOW) a frame enlargement from **CREATION** showing a triceratops family.



Brown's Karloff trilogy: THE MAN THEY COULD NOT HANG (TOP), BEFORE I HANG (with Edward Van Sloan) and (BELOW) THE MAN WITH NINE LIVES.

dangerous wild boars that attack without warning and kill you in a minute." The boars were brought over by pre-Revolutionary British officers who liked to indulge in "pig sticking" from horseback.

Critics compared *STARK LOVE* favorably to the "natural dramas" of Cooper and Schoedsack (*GRASS, CHANG*) and Flaherty's *MOANA*. Brown, unhappy over studio changes and censorship cuts, considers the released version "a pallid ghost."

Another directing job was *HIS DOG* (1927), produced by Cecil B. DeMille at Pathe. The picture starred Joseph Schildkraut and Julia Faye, but both were overshadowed by an amazing white collie named King. The story, more unusual than the title would indicate, is about a drunkard who is reformed by his somewhat intolerant dog.



Brown co-authored the popular Universal Jewel (the designation given to Universal's bigger productions), *THE MISSISSIPPI GAMBLER* (1929), with Joseph Schildkraut and Joan Bennett. The story has since been refilmed twice.

Brown describes the first all-talking picture he directed, Columbia's *PRINCE OF DIAMONDS* (1930), as "a Wolf Brand *COUNT OF MONTE CRISTO*." The picture has some picturesque elements not found in the majority of pictures made at the time, such as jungle adventure and a great deal of Oriental atmosphere. The aristocratic hero was enacted by Ian Keith, a fine actor whose career was blighted by too great a resemblance to John Barrymore.

Brown describes Columbia as "the Cinderella girl of the movies, started by three men in an old shack on Poverty Row. Harry Cohn, a violent, undisciplined man, gets most of the credit for Columbia's success. Actually, he was mostly a front man, a bulldog to scare off trouble, a fall guy kept in

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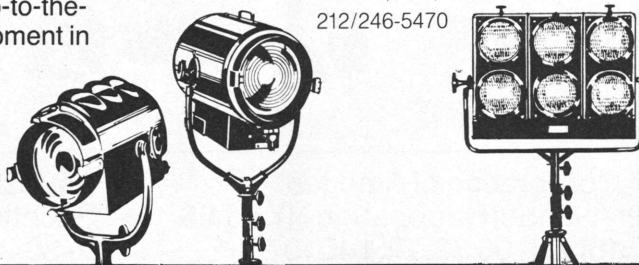
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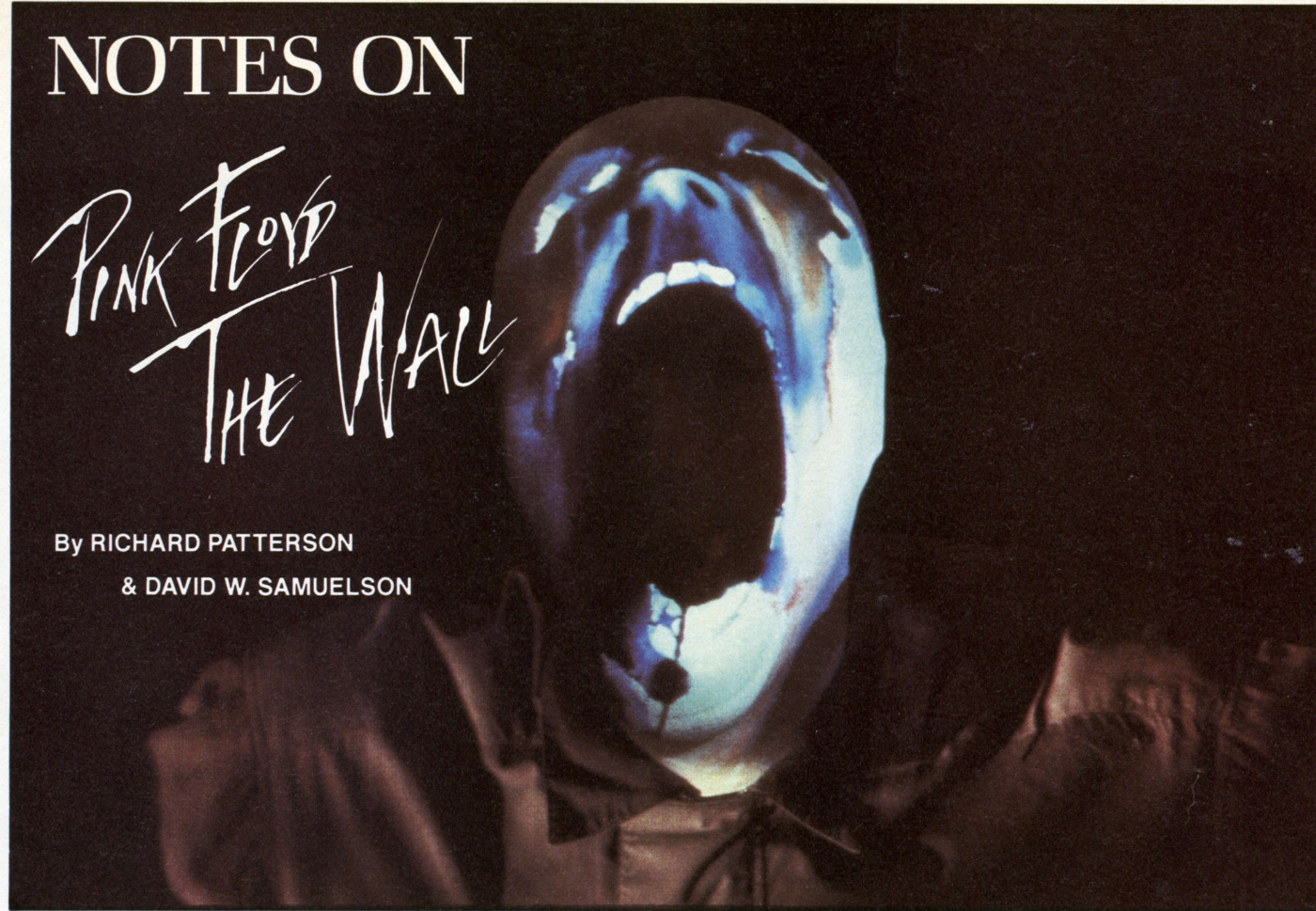
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NOTES ON

Pink Floyd The Wall

By RICHARD PATTERSON

& DAVID W. SAMUELSON

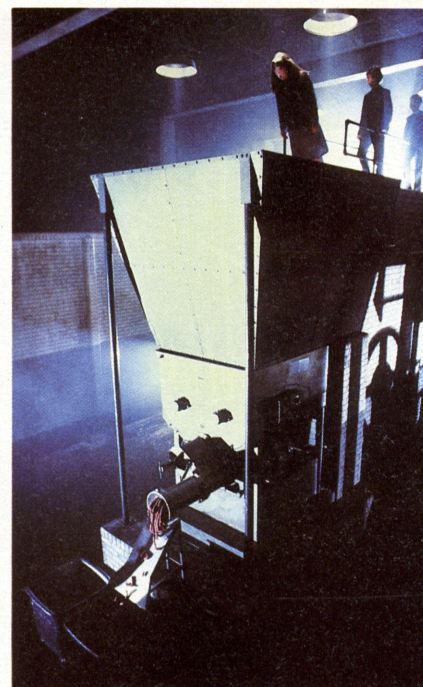
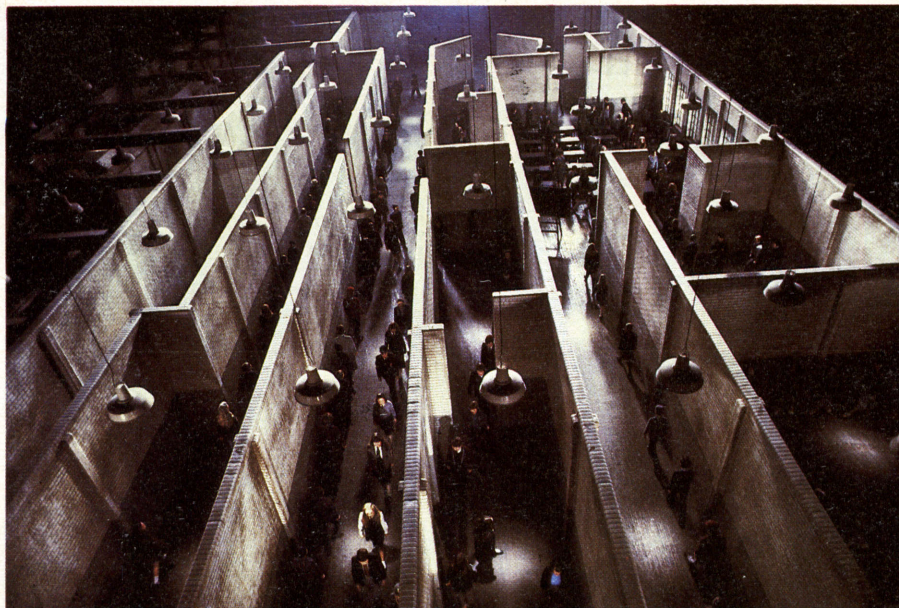


(ABOVE) Pink's primal scream expressing the anxiety and frustration at the core of the film is seen here in a live action shot which is being metamorphosed into an animated shot. (BELOW) In a fantasy sequence dealing with Pink's fear of insanity young Pink (Kevin McKeon) discovers Pink (Bob Geldof) cowering in the corner of a cell in a mental institution.



PINK FLOYD THE WALL is a nightmarish vision of life as experienced by an English rock musician. It is a unique film in many respects. A major studio release that is reported to have cost \$10 million, it does not have a conventional plot or even any conventional dialogue. It is an adaptation of a rock album, but the rock group Pink Floyd never appears on screen. It is a highly personal, semi-autobiographical statement, and yet it is a collaborative work involving several individuals with distinct styles and personalities.

The film is structured around a series of scenes depicting Pink, a rock star ensconced in a hotel room and undergoing what might be called a nervous breakdown. The film explores his consciousness with flashbacks and fantasy sequences using animation as well as live action, much of which has a surreal quality. Although the film may be disorienting to a viewer expecting a conventional story or plot, there is a logic to the structure. In terms of the information conveyed in the flashbacks there is a general chronological progression starting with the death of Pink's fa-



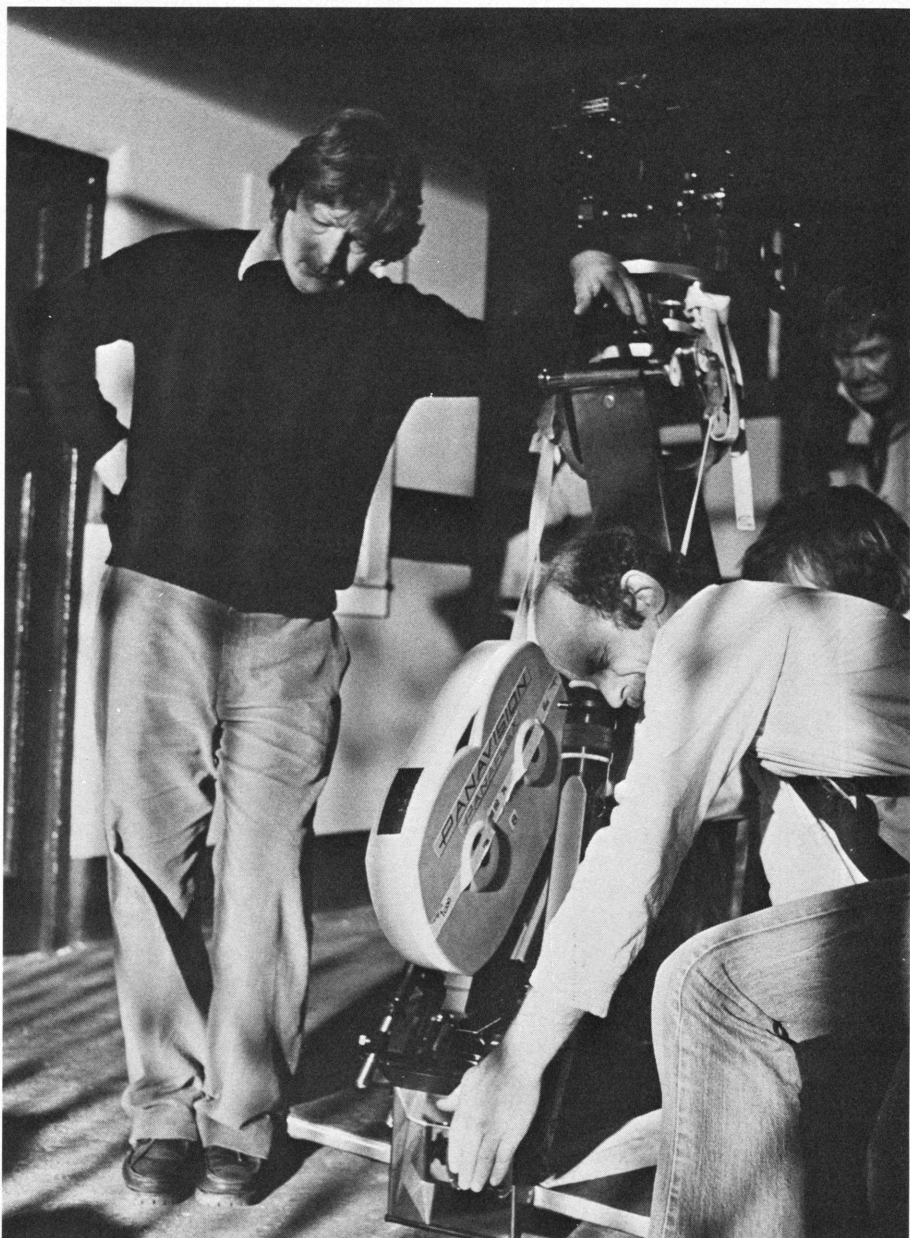
(ABOVE) Pink's schooldays are evoked with surreal live action images and Gerald Scarfe's animation. Young Pink fleeing across the playing field is a recurring image which underscores the nightmare of an education in which faceless children are routed through mazes and into a giant meat-grinder. (LEFT) Roger Waters, writer of the autobiographical album and film, chats on the set with young Pink (Kevin McKeon) and Pink's Mother (Christine Hargreaves).

ther in World War II progressing through Pink's childhood to his marriage and his career as a rock musician. Images from the flashbacks and fantasies associated with the flashbacks recur throughout the film often in the form of variations which augment the significance of the initial image.

The wall, which is the central image of the film, represents the alienation which isolates Pink from others and from his own emotions. It has been built up gradually throughout his life by various forms of repression until Pink has reached a point of total isolation. His violence as he destroys the furnishings of his hotel room seems to be a desperate attempt to break through the wall. There is an animation sequence in which the wall is destroyed but the overall impact of the film is not a sense of liberation but of imprisonment. The climax of the film is a vision of a rock concert as a fascist rally with Pink as the leader of faceless masses of followers. This vision expresses both Pink's contempt for his audience and his own self-loathing. It is followed by an animated fantasy sequence of a trial in which Pink essentially places his life on trial and his conflict with society is acted out internally.

Pink Floyd is a rock group consisting of Roger Waters, Nick Mason, Rick Wright and David Gilmour. The group was originally formed in 1965 and was the first group in England to use light shows as part of their concerts. They have enjoyed a popularity and longevity perhaps rivaled only by The Rolling Stones and The Who, with their 1973 album "Dark Side of the Moon" selling over 17 million copies. Their concerts have become increasingly theatrical and spectacular with extensive use of slides and film as well as lights and special effects. They have also scored several films including ZABRISKIE POINT and LA VALLEE.

The album "The Wall" was released in 1979 and has sold almost 12 million copies. All the lyrics for the double album were written by Roger Waters as an attempt to come to terms with the alienation he felt from his audiences. Self-examination led him through the personal relationships in his life back to his childhood experiences and the result was a series of autobiographical songs expressing his sense of the repressive forces which shaped his personality and resulted in the isolation he felt.



(ABOVE) Director Alan Parker and cinematographer Peter Biziou setting up a low angle shot with the help of the Samcine inclining prism. Extreme low angles and harsh light were two techniques used to contribute to the surrealism of the film. (BELOW) Camera operator John Stanier executing one of the many handheld shots in the film as Pink (Geldof) huddles against the wall.



Even from the beginning he saw the potential for a film in the material, and as soon as he had demo tapes of the songs he began discussions with Gerald Scarfe about animated sequences to be used first in concerts and ultimately in a film. Scarfe is a cartoonist and satirist whose drawings have been featured in *Punch* and the *London Sunday Times*. He had done an animated film for the BBC and an animated sequence for the concerts based on Pink Floyd's 1975 album "Wish You Were Here." He began work almost immediately on a sequence illustrating "The Trial," one of the songs for *The Wall* album.

The staging of *The Wall* concert was the most spectacular of all Pink Floyd's concerts requiring over 100 tons of equipment. It included a hotel room set, three gigantic inflatable figures designed by Scarfe (a woman, a schoolteacher and a pig), a Spitfire fighter plane which crashed in flames on the stage, and 420 massive cardboard "bricks" which were gradually assembled during the concert into a 30 foot high wall separating the group from the audience. Three synchronized projectors were used to project animated film sequences first onto a circular screen at the rear of

Director of Photography Peter Biziou on location at Barnstable where the Anzio sequences were filmed.



the stage and then onto the wall. The *Wall* concert was presented a total of 20 times to an estimated 500,000 people in 3 or 4 different cities.

Alan Parker describes in detail the evolution of the film from the concert in his article. Initially it was thought that the concert itself could be filmed. Pink Floyd had done a successful concert film in 1972, but *The Wall* concert did not lend itself to filming for a variety of reasons. Among these is the fact that the content of the songs cries out for subjective and surreal imagery. The animated sequences developed for the concert had this quality but photography of a real event—even one as unusual as the concert—could not hope to achieve the same degree of surrealism. Eventually the idea of using any concert footage at all was dropped, and the film developed into the highly subjective exploration of an individual psyche on the brink of madness by means of animation and carefully designed live action photography.

Since Gerald Scarfe had been involved in the visualization of the material from the beginning, he had the primary responsibility for designing the film. He drew illustrations for each sequence which were developed into extensive storyboard sketches used for planning both live action and animation. In some cases the same imagery was developed as both live action and animation for different parts of the film.

There are about 15 or 20 minutes of animation in the film which Scarfe designed and directed. Two extended sequences used for the concert were incorporated into the film, but the art work had to be adapted to the anamorphic format and rephotographed. In some instances it was possible simply to extend the black limbo surrounding the art to fill the anamorphic frame. In other instances additional art had to be created as, for example, in a scene where a wife of a teacher is beating him. By adding door jambs on either side of the scene so that the action appeared to be viewed from an adjacent room, it was possible to extend the art to fill the wider frame. Other sequences designed originally for the film rather than the concert were, of course, in the wider format.

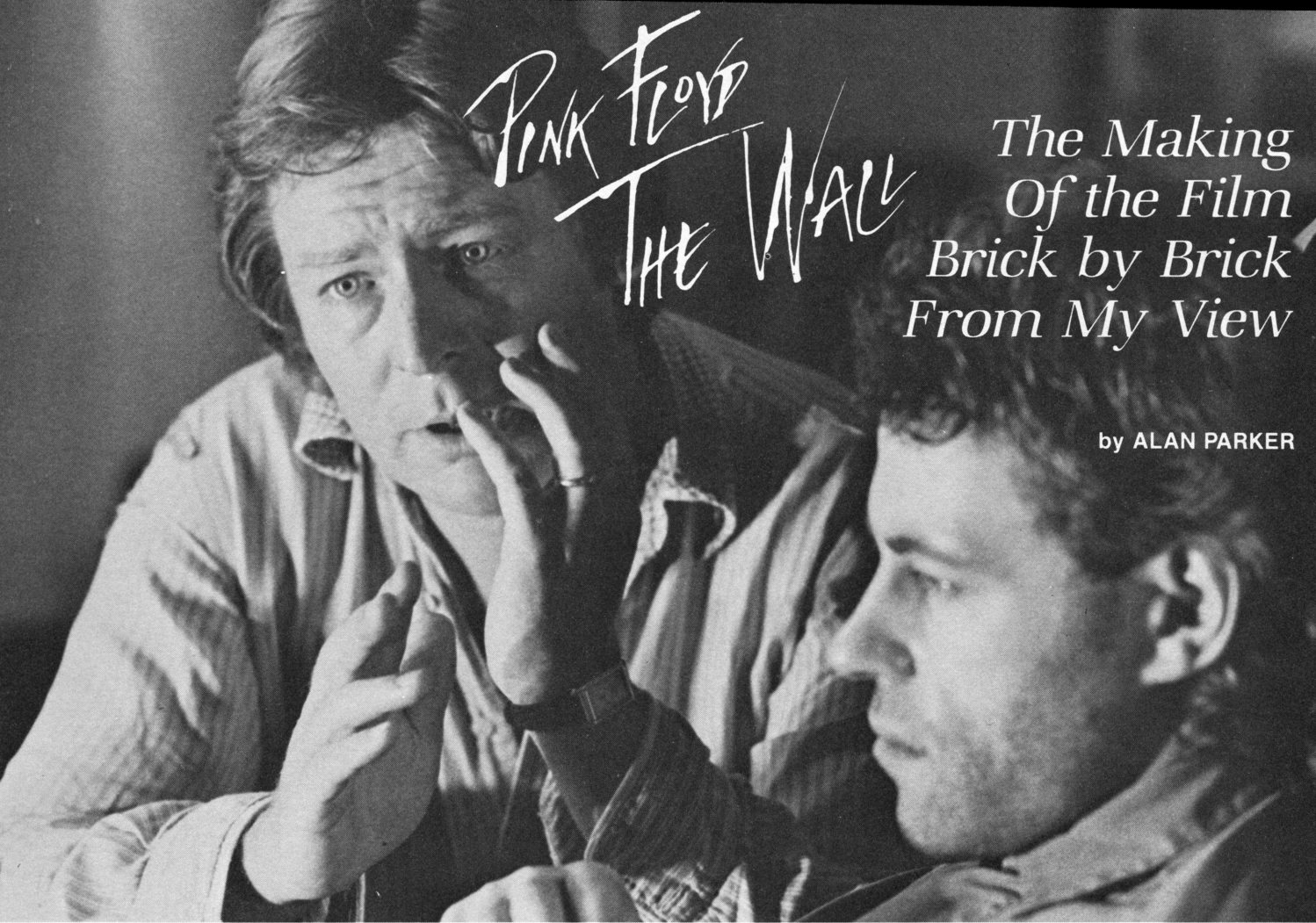
Because no major animation work had been done in England in an anamorphic format, it was necessary to adapt a camera specifically for filming animation for *PINK FLOYD THE WALL*. Kent Houston and Chris King

of Peerless Camera Company, who shot the animation, used a macro Panatar lens which was capable of focusing down to a 6½ inch wide field and devised a motorized focus control to permit follow focus on computerized moves up to about a 36 field. They discovered that the lens introduced a degree of distortion which resulted in a slight cropping of the art work towards the center of the frame, but they compensated for this by providing the artists with field charts representing the distorted field. The artists were able to allow for the cropping and as King puts it, "It was never an effective problem in terms of what people were going to see on the screen, but I think because there isn't really a Panavision lens designed to shoot animation, there are probably one or two things that could be improved in the system to give us a much more even field of focus from edge to edge. But by and large the results were very satisfactory."

Some of the sequences involved multiple passes for shadow effects and backlit diffusion effects. "There was one sequence," says King, "in the 'Goodbye Blue Skies' sequence with the warlord where the dove was metamorphosed into a bird which becomes a bomber and flies through the sky over London. Eventually it turns into a warlord and bombers fly out of its belly. There are various explosions and effects in that setup over the top of London. We had a lot of mixes from one scene to another and they become very drawn out where we were doing shadow effects and then a lot of small neon effects for explosions and for glowing eyes. Each one of these effects was a separate run. We had the complication of having to use very large artwork with field sizes up to 29 to 30 inches across and there were multiple movements of the camera, the table top and peg bars at the same time with dissolves. I think as far as my experience of animation shooting goes it was the most difficult shoot I've done in all my life."

One of the things that originally attracted Scarfe to animation was the ability to metamorphose one image into another and many of the images in *PINK FLOYD THE WALL* are constantly changing before your eyes. Animation is also used to transform live action images into abstractions or animated images.

For the live action sequences Scarfe's designs were supplemented
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Pink Floyd THE WALL

The Making Of the Film Brick by Brick From My View

by ALAN PARKER

Director Alan Parker discusses a scene with Bob Geldof, lead singer for the Boomtown Rats, who makes his acting debut as Pink. Parker originally signed on to produce the film adaptation of Pink Floyd's album, but took over as director when the production ran aground.

I first came to THE WALL as a fan. The music had been played and played in our house, oddly mainly by my children who, with more ephemeral pop taste, hadn't always shared my enthusiasm for Pink Floyd. I suppose I'd been a fan since "A Saucerful of Secrets" and over the years had played "Dark Side of the Moon" so often it ended up scratched and unplayable.

As I listened to THE WALL, it occurred to me that it had dramatic possibilities further than the polemic of 'We don't need no education.' The whole album had a narrative sense, although in those days what that sense was I can't say I fully understood. I'd been in New York when the concerts were performed at Nassau Colosseum, and I remember reading about it in the New York papers, but whenever the concert was performed, I seemed to be in a different place—even missing the London shows.

When I returned to England after FAME, I was having a telephone conversation with Bob Mercer at EMI, not about THE WALL in particular, but really the usual moans about the demise of the British Film Industry and its lack of imagination, and especially the lack of fusion with the more successful music industry. "Look at THE WALL," I said, "a number one album in goodness knows how many countries, an obvious narrative line, where is the film? Didn't anyone in the record division play the tapes to the film division?" Bob said they had. Roger Waters had always voiced the idea that he'd like to make it into a film but no one could quite figure out how. And anyway, priorities on the record and show had taken over.

Bob 'phoned back ten minutes later and said he'd spoken to Roger who would love to talk to me about it. At the time my intentions were really to give advice to Roger on who to avoid

getting involved with in the film industry. Traditionally, Rock and Rollers are always plagued by hangers on, and tend to attract the mediocre side of the film industry. As it happened, he lived quite close to me and on first meeting, it was obvious he was not the typical laid back, zonked out rock star. We sat in his studio talking over the history of the piece and he demonstrated its evolution with snippets of original demo tapes he'd made alone, locked behind a 'wall' in his old house in the country. They were raw and angry—Roger's primal scream, which to this day remains as the heart of the piece. He had been meeting with film directors and reading scripts by various 'established screen writers,' because that was the advice everybody had given him. "Sure it's a hit record, but where's the script?" I'd been involved with other rock and roll film projects before, and had seen the original intention of the creators lost by this process, the most notable



(ABOVE) Anzio beachhead as fantasized by Pink, whose father was killed there. (LEFT & BELOW LEFT) In Pink's fantasies a rock concert becomes transformed into a fascist rally with Pink as the leader of a mindless mob. (BELOW) Parker with artist Gerald Scarfe and production designer Brian Morris. Scarfe's illustrations provided the inspiration for set designs as well as the animated sequences.



being the film of Sergeant Pepper. I suggested he didn't need another writer. He was the writer. The ideas that he was articulating very lucidly were so far advanced, he ought not to get some film industry hack to take away his original intentions. The only reason he'd agreed to the original premise, I think, was his fear as a writer, of not being able to write dialogue. My contention was that a conventional screenplay wasn't necessary; to let the music be the narrative of the piece and hence keep the piece closer to his chest. He suggested I come back the next day and meet with Gerry Scarfe, who had collaborated with him on the design of the live show. Gerry was an artist who's manic drawings I'd long admired in *Private Eye* and the *Sunday Times*. When he arrived, he unrolled a sort of storyboard; a patchwork of his spikey drawings—somewhat sepia with age, to which I remarked, "For a director, this is like winning the pools!" (a phrase that was to haunt me in the months to come). I still had no intention of directing it myself. It seemed Roger and Gerry had invested far too much creatively already for me to comfortably take the project away from them in my normal way. Also, I was more than preoccupied with SHOOT THE MOON. I was about to leave for location in San Francisco in three weeks and was reluctant to commit to any other project. Roger was very persuasive however, and I spent the next two weeks going back each day, going through the script treatment Roger had written. Gerry Scarfe remarked to me one day, if I didn't want to direct it, why did I keep going back? In truth, my original interest was in getting a worthwhile film project off the ground, a process I'd been through many times before. Eventually I left for San Francisco to prepare SHOOT THE MOON. Roger phoned me one day with an idea. Why didn't I produce the film with him, with Michael Seresin (my long time cameraman, who Roger had met) directing in tandem with Gerald Scarfe. The idea appealed to me because it meant I could be involved, vicariously, with a project I had great hopes for, without having to sweat the blood directing requires.

In January of 1981 we began filming SHOOT THE MOON and, simultaneously, I arranged for our usual associate producer, Garth Thomas, to



(ABOVE) Parker and Geldof prepare for a scene in which Pink calls home long distance only to discover that his wife is with her lover. (BELOW) The conflict between the sexes as experienced by Pink is represented by Scarfe's animated flowers which metamorphose into shapes which are both erotic and vicious.



Continued on page 1060

HIGH SPEED BLOOD AND WORMS

Oxford Scientific Films Meets Pink Floyd

by PETER D. PARKS

Editor's Note: Oxford Scientific Films, Ltd., at Oxford, England, began as a specialist in wildlife photography but has in the past several years been involved in producing visual effects photography for feature productions.

From what we heard, our involvement with THE WALL arose through Alan Parker seeing our old promotional tape—a tape which is sadly out of date and which at that time we were about to replace with a new version. This meant that when Garth Thomas came to us in the summer of last year we had a lot of new material to show. Some of this material was strictly special effects—arising from our work on ALTERED STATES, SUPERMAN I, FLASH GORDON and LAND BETWEEN TWO RIVERS as well as our more traditional but specialised wildlife studies. Many of our recent biological projects have involved a lot of high speed and time-lapse photography.

The biggest project we have ever mounted under our own auspices was completed last year. This was a £100,000 one hour special entitled "Sexual Encounters of a Floral Kind!"

This picture is not what one may think. It was a very detailed study of some of the extraordinary pollination mechanisms employed by plants. Some of the mechanisms are explosive and require frame rates of 3000 frames a second to show the detailed behaviour. Others take hours or days or even months and then we use time-lapse.

Alan is a highly imaginative individual and he had let some of this rub off on Garth, who certainly should take some of the credit for seeing and encouraging the possibilities. It's probably best if I give you a few examples. Early in the film Pink, played by Bob Geldof, is involved in a sequence in which reality is mixed with dream and hallucination and a certain amount of Kensington gore was called for. Alan asked whether we could enhance the main shooting of blood dripping onto hotel car-

pets—in time to music, of course—the song "Don't Leave Me Now." His idea sprang from a shot he saw of milk falling into milk at 3000 fps to produce a beautiful corona effect.

The question was could we shoot at 3000 fps on anamorphic format and 35mm gauge? The answer was, simply, "no!" However, we did suggest two possibilities and it was agreed we'd try both and compare the results.

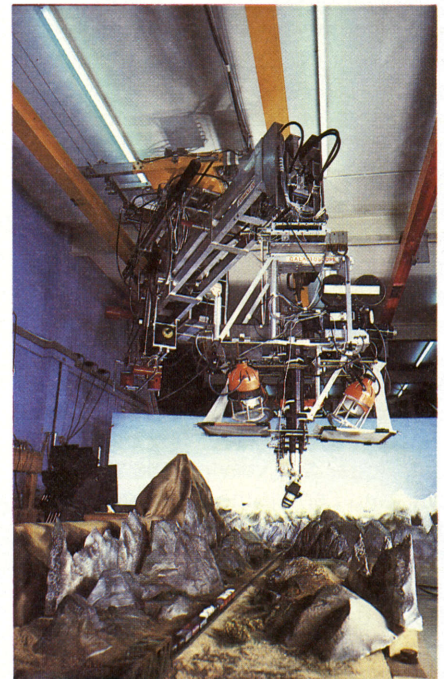
Our first suggestion was to simulate a 3000 fps shot using other special effects to give the same results but at more normal frame rates and therefore on 35mm film stock. We devised three entirely separate scenes and each was shot with periscope optics beneath the surface of high viscosity, high and low specific gravity colourless fluids. By knowing one's solutions and the relative miscibility it is possible to produce some very unusual effects. You'll realise we were really going about it in an odd way when I tell you one of the sequences was shot with the drops falling upwards!

We started to get what we set out to get, but by then main shooting had begun and we could never get direct criticism and comment from Alan. For some time we soldiered on using our own ideas. Then a message came through that nothing had the power of that ol' milk shot. Obviously Alan wasn't aware of how the pseudo—high speed was going to turn out eventually and he wasn't too happy with what he'd received up until then.

For this reason we decided to leap right in and produce the very best quality 16mm, 3000 fps prism camera footage. With great care we set up the system and shot hopefully good quality footage lit for the very best quality negative response. The shot we got back gave us a great thrill. Not only had we got a splendid corona but because of the way we'd shaped the receptacle receiving the drop we succeeded in making the corona fly right through itself. The footage was then sent to Pinewood. Only by talking directly to Gerry Hamblin was it possi-



Julian Brooks/Jonathan Watts/G.I. Bernard



Dave Shale



P.D. Parks

(TOP) High speed blood drops simulated by Oxford Scientific Films. (CENTER) Cosmoglide and Galactoscope camera system with the roll-over lens filming a miniature train for the promo reel which led to work on PINK FLOYD THE WALL. (BOTTOM) Pink's wrist watch as seen at the start of a long tracking shot in extreme close-up.

ble to get further constructive criticism. On squeezing the shot in the blow up process to 35mm anamorphic it became apparent that either the point of contact or the point of major activity were out the bottom or top of the frame. The other thing we learnt for the first time was how the shot should be lit to match the main shoot. We'd lit it much too well. This actually raises a good point. On such high speed shots light is the commodity in shortest supply and when you know that everyone is expecting you to have difficulty achieving sufficient lighting levels as well as it being essential that the negative is well exposed it is the hardest psychological battle I've yet encountered to light the scene in a moody fashion to match some very low key main unit shots.

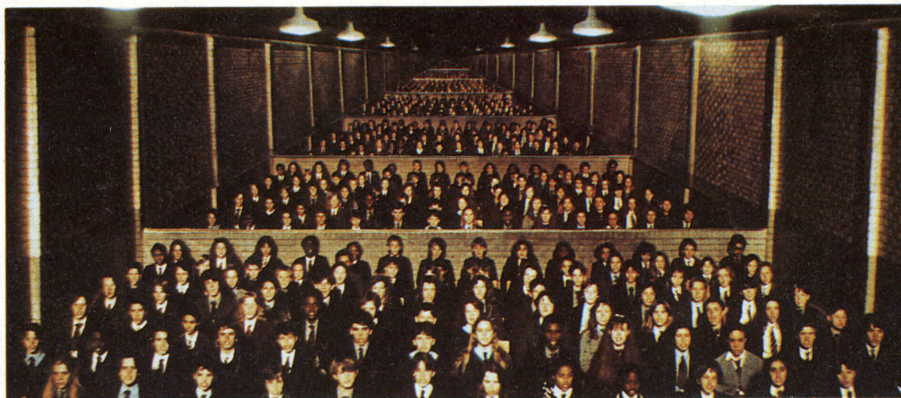
We had to get the light, the mood and the action spreading left and right rather than disappearing through the top of frame. The last point was the tricky one. It required experimenting with several specifically designed capsules in order to spread the classic coronet shape across the picture. We eventually got several very suitable takes all on the 200' roll of neg. We managed to hold T11 at 2000 fps with a frame about half natural size—incidentally we eventually used 2000 fps because 3000 made the action too slow.

I ask myself how the grain stood up to the blow up and squeezing. I've been assured it's fine, but there has to be some loss there and we'll only know when we see the final print.

A lot of people quiz us about the steadiness of the prism camera and on an earlier test shot we'd received a lab report that the image was weaving about a bit. Eventually, however, we got that particular shot back and analysed the movement across the "frame-line" and we were able to detect very little. That same camera—a Hadlan Hi-Speed, capable of 10,000 fps—had given us a bit of trouble a month or so before and tests Hadlan and we had conducted at the time had shown us that up to 3000 fps the steadiness problem was not bad. Above that speed it appeared to become progressively worse. In reality, these limits will almost certainly depend on individual idiosyncrasies from camera to camera.

We have a registered 500 fps Photsonics IPD but a lot of recent work with this camera had produced high

BUILDING THE WALL OPTICALLY



An optical composite shot by Roy Field for PINK FLOYD THE WALL. A portion of the wall and the first group of children were photographed on the stage and then reduced several times and matted together with a painting of the wall.

resonance unsteadiness so we are less than convinced that register at these speeds is as effective as one might think from comparison at more normal frame rates.

The time lapse work that Alan saw—arising from our pollination film included not only growth processes but also decay and rot. Alan had already scripted a surrealistic scene where dead Pink's head is devoured by organisms—fly maggots in this case. Garth had shown Alan a shot we had done some years ago of a mouse carcass being devoured by blow fly larvae. For reasons best known to himself this appealed to him.

We accordingly arranged to shoot a test. The head was made of minced pork and skilfully assembled and sculptured by Paul England. We looked after a rather unpleasant fly maggot culture which smelt like nothing on earth as we primed it to produce emergent flies (to lay eggs on the head) by rearing them on fresh liver and a rabbit carcass.

For the test we used an interval of 2000 seconds and dropped it to 1000 seconds as things "hotted up." The smell was so bad we had to completely seal the room in question with gaffer tape. Even so the girls working at OSF kept giving those of us working on the film very odd looks. The smell hung in our clothes and at night even travelled home with us. (At this stage of the year we were being approached by another film producer to make a horror movie in which body rot

was the principal feature. Appetites definitely diminished that September!)

The test result was horrible! It did, however, appeal to Alan and, although shot at far too slow a frame rate, it was cut into the rough edit from the very first. Over the succeeding months we then repeated the shot twice more using different angles and faster frame rates. In the final sequence the maggots caused the eyeballs (sheep's eyes) to explode out of the sockets and hang on sinews half way down the cheek!

One point of interest was that the drying process—which we kept minimal by high humidities within the time lapse studio—caused the lower jaw in the test to slowly close. When the film was run fast on the Steenbeck the movement made it look as if the head was still alive and about to complain about his treatment!

We were also commissioned to execute a number of very complex periscope or snorkel shots. One that went ahead was a single tracking shot around Bob Geldof. We used our Cosmoglide suspension system with the Galactoscope camera head. The shot began with a full frame 1:1 view of a Mickey Mouse wrist watch. Very slowly the camera tracked, at 1:1 along Bob's wrist and hand, found a burning cigarette, around which it circled, pulled back and tilted up to reveal Bob's head slumped on his chest as he sat in a chair beneath a

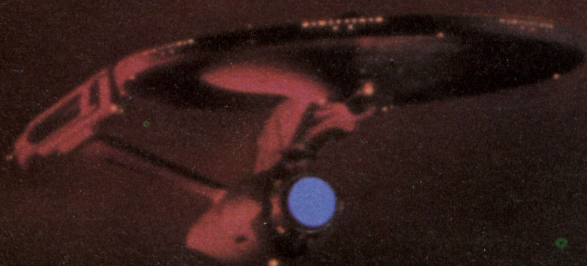
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SPECIAL EFFECTS FOR

STAR TREK II THE WRATH OF KHANI

In August, 1981, Lucasfilm's Industrial Light and Magic was approached by Paramount Pictures to begin work on special visual effects for STAR TREK II. Ken Ralston and Jim Veilleux were asked to supervise the planning and execution of the effects, and Rose Duignan was hired to prepare a budget and coordinate production. Although Paramount was committed to a release date of June 4, 1982, the initial script and storyboard package contained a fairly modest amount of effects work. Two major rewrites later, a much more exciting script evolved—one that evoked the best elements of the television series. It called for a far greater number and variety of effects, however, including several that were yet to be designed. At this point, seven months remained to complete a project with 150 composite scenes. To complicate matters, many of ILM's resources were committed to POLTERGEIST and E.T. for the same time period.

In order to work as independent units, the two effects supervisors split the film into sequences that would have little effect on each other. Ken Ralston took on the Ceti Eels, the initial skirmish between the *Enterprise* and the *Reliant*, and the final battle deep within the Matura Nebula. Jim Veilleux supervised sequences involving the Genesis Effect and planet, Eden Cave, computer graphics, warp drive, transporter effects, live action plates, the film's opening and closing shots, and a variety of space scenes containing space lab Regula One, Ceti Alpha V, Gamma Regula, the *Enterprise*, and the *Reliant*.





SPECIAL EFFECTS FOR STAR TREK II

WARP SPEED AND BEYOND

by JIM VEILLEUX



Modelmakers Bob Diepenbrock (LEFT) and Brian Chin add detail to space lab Regula One. Originally built as a space office complex for *STAR TREK THE MOTION PICTURE*, the miniature was turned upside down and modified for use in *STAR TREK II*.

Modelmaker Suzanne Pastor studies surface detail of Gamma Regula moonscape. 300-pound sculpture was dusted with a light coat of microballoons to simulate lunar surface texture.



Terry Chostner



Matte painter Frank Ordaz adds finishing touches to a full view of the Genesis Cave.

Lava-bubble set devised by production designer Joe Jennings and art director Mike Minor was used to place live-action scene inside a matte painting of the Genesis Cave. Director Nicholas Meyer (CENTER) tells cast how to react to unseen splendors of the imaginary cave.



With such a short time to execute so many different effects, it was vital to accomplish the research phase rather quickly so that the work could be allocated to people and equipment at ILM and to sources outside the company. The abbreviated schedule, while uncomfortable at times, turned out to benefit the film in many ways. It forced us to work closely with Paramount at the beginning of the project and focus everyone's energy on visuals that would work dramatically in the script. It also forced us to seek out simple, direct methods for executing the effects, since there simply wasn't time to develop groundbreaking techniques or expensive hardware from scratch.

During a six-week period that seemed like six days, I met frequently with Producer Bob Sallin, Director Nicholas Meyer, Production Designer Joe Jennings, and Art Director Mike Minor to transform verbal ideas from the script into fairly concrete visuals. Between meetings, I worked with animators, cameramen, matte painters, computer programmers, a chemist, and a pyrotechnics expert to develop film tests or stills for each major effects sequence. Bob Sallin would review the tests with us, offering feedback and encouragement. By the end of the six weeks, we had determined the look and basic production techniques for nearly all of the effects. With Sallin's help in previsualizing the finished film, we had a good idea of how each effects shot would cut into the live action footage five months later.

Early in the project I began to explore computer graphics as a means of producing some of the sophisticated visuals one would expect to see on a 23rd Century starship. What started out as a search for something to put on the *Enterprise* viewscreen turned out to provide many of the effects in the film. When Admiral Kirk reviews the Genesis demonstration

Photos © Lucasfilm, Ltd.

Terry Chostner



(ABOVE) Pyrotechnics photographed at 375 fps with Bruce Hill's pin-registered camera was composited with blue-ring artwork for the initial detonation of the Genesis Effect. (RIGHT) Hill's 35mm high-speed cameras on the floor of the Cow Palace shoot straight up to give explosions a "zero-gravity" look. Camera on left consumes a 1,000-foot magazine in 6 seconds when running at top speed of 2,500 fps. Camera on right has a precision pin-registered movement capable of 375 fps. Explosions rigged just below the black grid could be set off 80 feet above the floor where high speed cameras were positioned. Black square served to absorb intense light in immediate vicinity of explosion and served as a backing for a blue "smoke ring" effect created by pyro expert Thaine Morris.

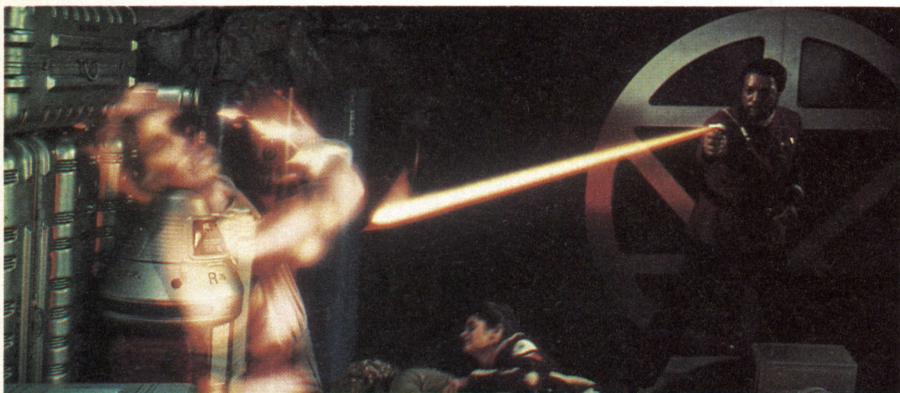
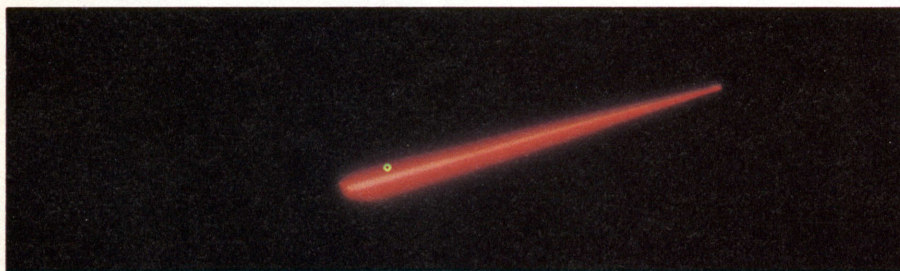


tape on his office monitor, he is watching an electronic simulation of an evolving planet created by Lucasfilm's computer division and a computer model of a DNA molecule developed by Robert Langridge at the University of California, San Francisco. The main title and closing shot star fields, the warp drive effect, tactical displays for the *Enterprise*, and nearly all star fields in the film are electronic images created at Evans & Sutherland in Salt Lake City. The use of computer graphics, a relatively new special effects tool, not only helped relieve the critical workload problem at ILM, but it also gave us visuals that would have been impossible to create by traditional means. The dramatic quality of these images is a subtle one that results from dynamic camera moves in which every part of the picture advances with exact mathematical precision. Although

the techniques of filming computer graphics are fairly simple, creating detailed visuals is difficult and time-consuming. Fortunately we were able to rely on projects and methods that people had started developing several years earlier.

Evans & Sutherland is a computer graphics company located in Salt Lake City with about 600 employees. The company is best known for the real-time visual displays it produces for the world's most advanced flight simulators. Recently they have developed a compact computer graphics system called "Digistar 1" that will project moving starfield images on the dome of a planetarium. The system contains a data base describing 6,719 stars that surround our solar system, with the position and brightness of each taken from actual astronomical data. A "view" of the data base can be projected onto the plan-





etarium dome or seen on the screen of a high-resolution (4,000 x 4,000) video display. By manipulating a set of joystick knobs, the viewer can move through the starfield in just about any direction desired. With the position of each star recalculated at a rate of 12 times per second, and the image refreshed on the display screen 60 times per second, what results is a move through space with an extraordinary sense of depth and resolution.

In order to photograph the rather delicate star field images on the high-resolution display, I realized that the moves normally executed on Digistar would have to be slowed down considerably so that we could shoot at one frame per second or less to get exposure. The system's designers, Brent Watson and Steve McAllister, were able to make minor software changes so that we could shoot an initial test on film. Effects cameraman Scott Farrar and I brought ILM's Empireflex VistaVision camera to Salt Lake City to shoot the test. After viewing Ektachrome stills shot in the morning to pin down exposure range and color correction, we crammed a variety of moves and effects on the Digistar system into a 1-minute piece of film. Analyzing the test back at ILM, we realized that we had a technique for producing the background for the film's main titles—a slow, stately move through space that would last nearly three minutes. Rarely had I seen a flat image impart such a convincing sense of depth and scale. We were also close to having a

Continued on page 1054

In order to produce phaser disintegration of a foreground actor with other actors moving in the background, live action scene was divided into two elements and enhanced with animation. First, background and foreground actors are rehearsed together to establish their marks. Then background actors and props are photographed in VistaVision to produce background plate (A). Terrell (Paul Winfield) aims phaser toward left foreground as Lt. Saavik (Kirstie Alley) pushes David (Merritt Butrick) out of harm's way. A phaser beam animation element (B) is roto-scoped to match phaser position. To produce foreground element (C), background actors and props are removed, and ILM's portable blue screen is slid into position. Jedda (John Vargas) assumes his rehearsal mark in front of blue screen and reacts to phaser hit. Animator Kim Knowlton's airbrushed disintegration artwork (D) matches Jedda's position frame by frame and replaces him via optical dissolve in final composite (E).

SPECIAL EFFECTS FOR STAR TREK II

MAMA EEL AND THE NEBULAE

by KEN RALSTON

During the last few years I've flown space ships down the Deathstar Trench in STAR WARS, dodged asteroids and fought Imperial Walkers in EMPIRE STRIKES BACK. I also had baby dragons devour a princess and their mama battle an old sorcerer in DRAGONSLAYER—not exactly your everyday routine. STAR TREK: THE WRATH OF KAHN was no exception.

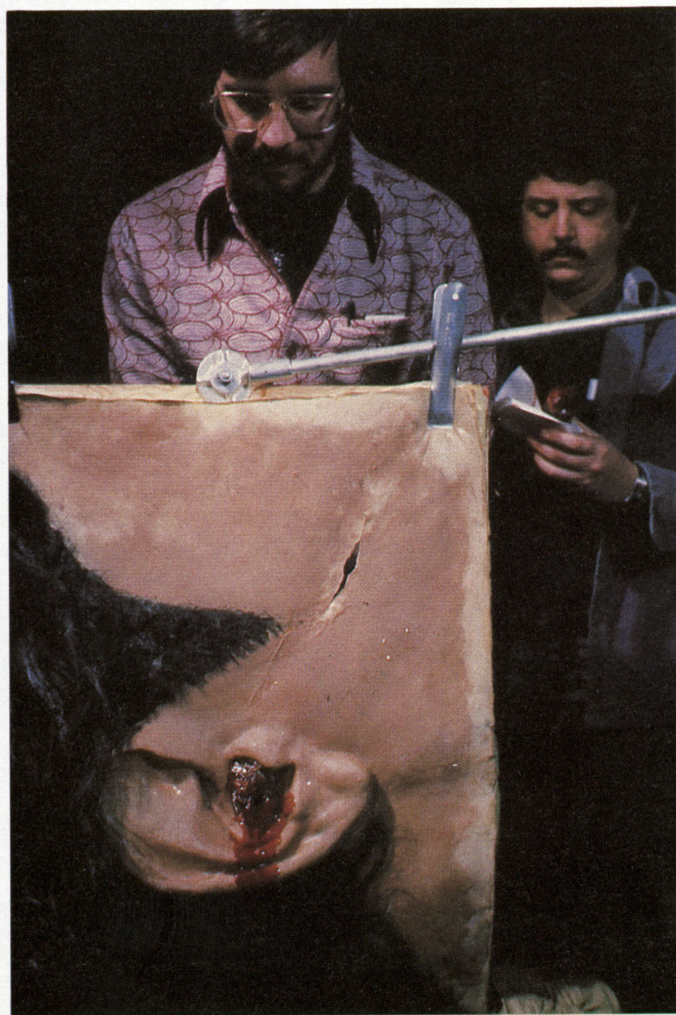
Before any work could begin, we had to study every storyboard concerned with the optical effects. Attending our initial meetings were Nicholas Meyer, director; Bob Sallin, producer; Joe Jennings and Mike Minor, art directors; Rose Duignan,

production manager; Steve Gawley, chief model maker; Jim Veilleux and myself. Once we understood the movie; its dynamics, character, and the intent of the shots, we started to organize departments and basically set the mood of Trek II throughout the ILM facility.

Once all the script revisions were complete, several wheels were set into motion. Steve Gawley and the model shop started building the U.S.S. Reliant. Editorial, headed by Art Repola, organized to handle the tons of film that would be passing through that department. Camera tested ships against blue screen,

nebulae, explosions, etc. Optical started doing some test composites and all of us saw a lot of difficult work ahead of us with hardly any time to do it—a common complaint of special effects companies. Soon, we were right in the middle of it.

Ceti Alpha five is a planet of little, or no resources. Hot, desolate and arid, it's a planet where just staying alive is next to impossible. There is one species native to Ceti Alpha: the eels. This aspect of the film was contributed by Bob Sallin, and he gave me the task of designing and bring to life these bizarre critters. Taking all the particulars into account—story sig-

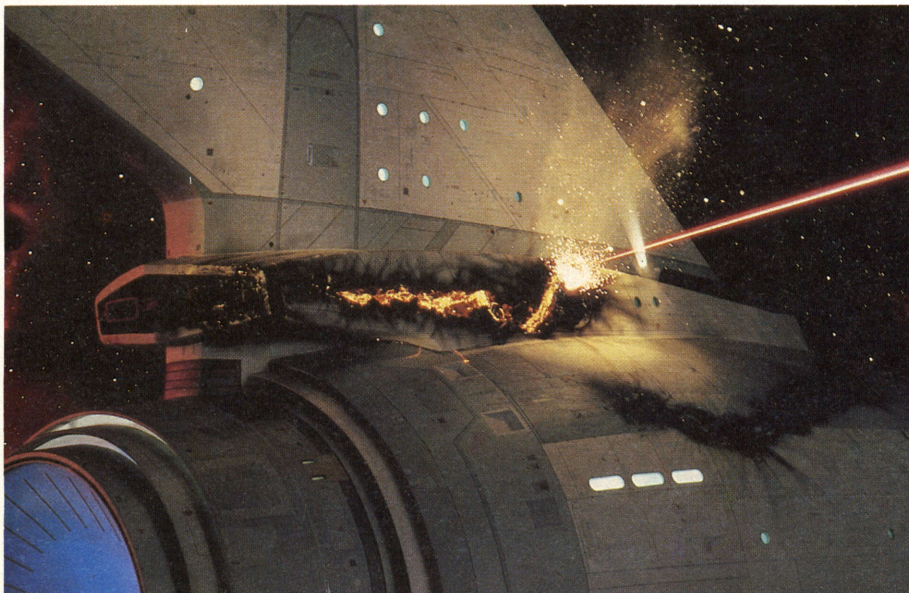
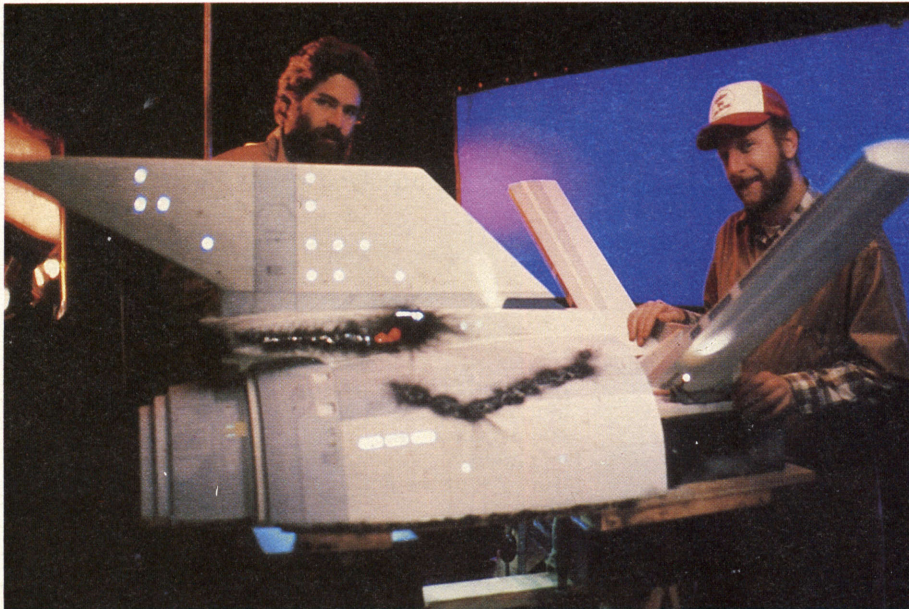
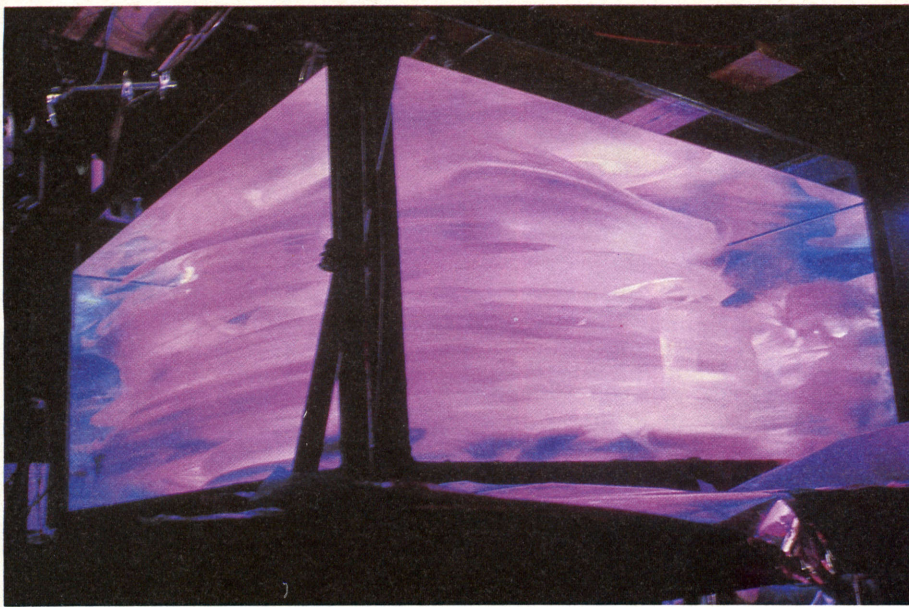


(LEFT) Ken Ralston operates the Ceti Eel behind the foam ear, assisted on the blood squirter by Ray Gilberti. (BELOW) Mama eel in the sand tank. All the mechanisms to operate the creature were under the set.



Terry Chostner

Terry Chostner



nificance, planet's weather, terrain, etc.—I went about drawing different versions of the animals. I wanted an organic look to them. That is, a look that appeared naturalistic, and believable—not something so alien and weird that an audience would have a hard time accepting it. I guess I succeeded. Several people I spoke with thought they were real garden variety bugs!

I sculpted the mama eel in Roma Clay. Sean Casey of the model shop made molds of it and cast it in Schram foam (a very flexible foam rubber). The casting was cleaned up, and fitted with a mechanism to move the jaws (in real life a modified tea strainer), and the tail was rigged with a metal rod to move it. The shell was of hard urethane cast separately from the eel, and applied later before painting. The paint was acrylic mixed with latex rubber, and sprayed with Armor-All to keep it from rotting.

There were many other eels made. Small ones for the scenes of Chekov (Walter Koenig) and Captain Terrell (Paul Winfield) screaming as the eels inch along their faces. This was a simple technique of monofilament tied to foam rubber eels, dipped in a clear, thick slime, pulled along their faces in an inch-worm fashion. It took many takes to get the right shot, and both Koenig and Winfield had to endure having some very gooey bugs messing up their faces. Lucky for me they had so much patience. They were great sports, and never tried to break my neck once!

Eels five inches long were made for the shots of the creatures slithering into the victim's ear. A large ear was made to duplicate Chekov's ear. The eel that exits the same ear later in the film was 6½ inches long and sculpted to be more developed. All had the basic mechanics of the mama eel.

Panavision equipment was used to shoot these sequences, using an anamorphic zoom lens. Mike Owens was assistant, Sel Eddy operated, and I directed. We shot on Fuji 250, to match to the live action that Gayne

(TOP) The Nebula tank filled with swirling clouds of latex, and lit with many multi-colored lights. (CENTER) Jeff Mann and Steve Gawley working on large section of Enterprise for damage shot. The area to be destroyed was made of wax, then animated one frame at a time coming apart. (BOTTOM) Final shot of the phaser hit on large section. Phaser, series of explosions and sparks were added in by the Animation Department.

Rescher (director of photography) shot. It worked great!

The first time the spaceships Reliant and Enterprise meet, the Reliant fires on the Enterprise, and a small skirmish between the ships follows. Since spaceships in space are not exactly new, we wanted something to set it apart from all previous space flights.

Both Enterprise and Reliant are majestic ships, something akin to grand whaling vessels at the turn of the century. Now, being a closet Trek fan from way back, I wanted to capture some of the boldness and spirit the show had in its visuals. One way was to continue the use of star fields—with an accentuated sense of depth to them—a technique crudely done on the TV series. We refined this effect by creating all the star fields for the show by computer. The Evans and Sutherland Company in Utah supplied all the star field effects—the sensation of depth is subtle *and* striking, adding a nice edge to the battle.

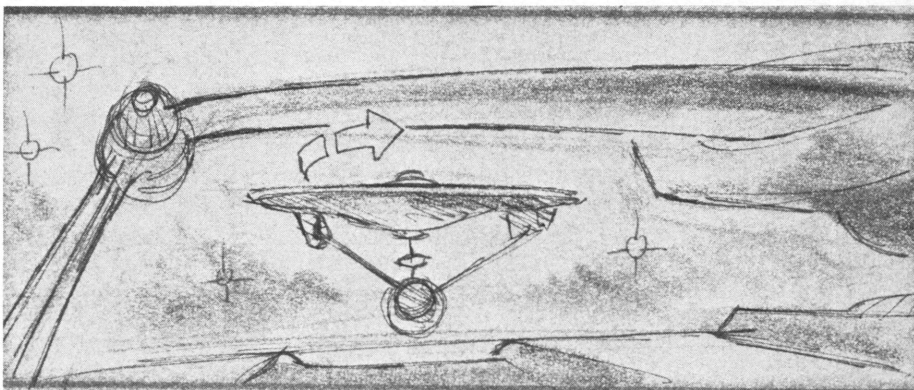
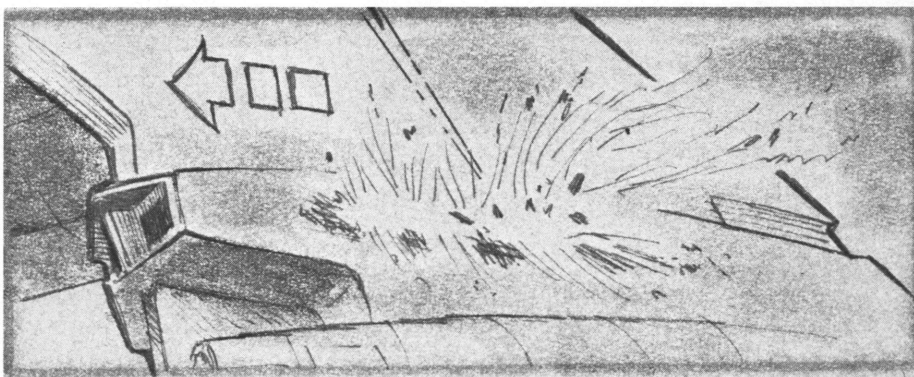
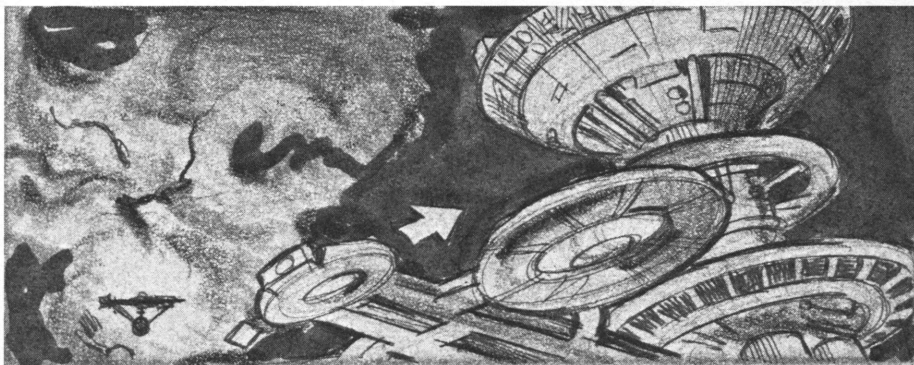
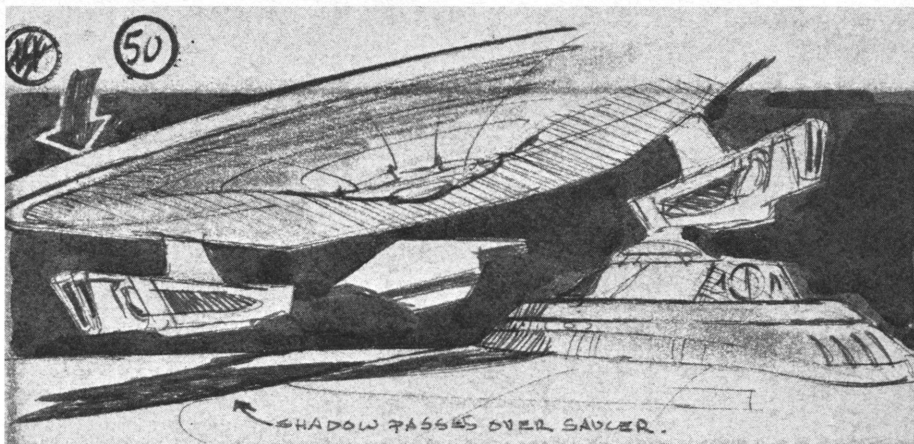
The model of the Enterprise already existed, built by Doug Trumbull's effects crew on the first Trek movie. The Reliant, however, had to be built from scratch. Once a design was settled on, the model shop geared up and constructed it in record time. It's a gorgeous model, perfectly constructed for shooting. It's light (vacuum-formed sections over a very light aluminum interior frame), highly detailed, non-reflective (easy to shoot using the blue screen matting process), and could be easily mounted from all sides for any possible setup.

The camera crew, Don Dow, Eddy, Owens and myself, shot all the models with the same motion control system used on STAR WARS and THE EMPIRE STRIKES BACK.

We tried using an f-stop of 32 for maximum depth of field, and shot about one frame every 2 seconds. For the long scenes it might take 10 hours to shoot one element. Much of the lighting for the ships followed Trumbull's lead, except we styled it with a bolder stroke. All our lights had a 212 yellow gel to make Bruce Nicholson's job in the optical department easier. The slight yellow tint aided in eliminating blue spill problems from the blue screen, and gave Bruce better information on the negative to help him give us the best mattes this side of the Pecos.

There is battle damage sustained by both ships in this sequence. The

Continued on page 1052



Mike Minor's detailed storyboards were used for planning all the special effects shots in the film.

SPECIAL EFFECTS FOR STAR TREK II

THE GENESIS DEMO

Instant Evolution with Computer Graphics

by ALVY RAY SMITH

Since the special effects for Paramount's production *Star Trek II* were to be co-produced by Jim Veilleux and Ken Ralston at ILM (Industrial Light and Magic), the Lucasfilm special effects division, Jim Veilleux asked the Computer Graphics Project to consider doing the following scenes for his part of the production:

- A molecule sequence showing the transformation from crystal-line inorganic molecules to DNA-type organic molecules, illustrating the "Genesis Effect."
- A planet size demo of similar nature, showing the transformation of a dead planet into a live one (originally to have been a live-action rock-size demo).
- A voice recognition sequence for positive identification of Captain Kirk, for permission to see the Genesis Effect demo.
- A retina recognition sequence for further identification.

All sequences were to be on video monitors in the live-action set to accommodate our current ability to do only low resolution imagery. The voice recognition sequence was to use visual representations of vocal phenomena—e.g., sound tracks, frequency spectra. The retina sequence was to be a trucking shot from outside an eyeball, through its pupil, into the interior for a final pattern recognition scene with the retina. Because of fear of overcommitting our young group and partially prepared software, I proposed to Jim that we do only one of these sequences totally (the planetary Genesis Effect) and part of the retina recognition sequence (the retina pattern recognition

portion). The "Genesis Demo," as the first sequence came to be known, was selected because it seemed to fit well with our already scheduled software development plans (for texture-mapping and matting), required only simple data structures (a sphere), and would need one-time-only code of fairly simple nature (e.g., 2-dimensional pixel wipes or related 2-dimensional hacks). A "hack" in this context is a quick-and-dirty program written just for the moment, with no generality, with no apparent future application, and filling no allotted slot in an overall software system. Our plans were later elaborated.

I also proposed that Bob Langridge of UCSF be asked to do the molecule sequence, which he gladly did, and that ILM do the flying into the eyeball. Jim and Paramount had decided by this time to scrap the voice recognition sequence. We were aware that Jim was filming star fields off the E&S (Evans & Sutherland) Digistar system in Salt Lake City and briefly considered doing these locally as well. This was rejected primarily because E&S had a superior machine (to our E&S Picture System II—the Digistar is a souped-up version designed for planetarium shows) and also because Jim was pleased with results obtained from them and did not see any reason to ask us to commit to yet another sequence.

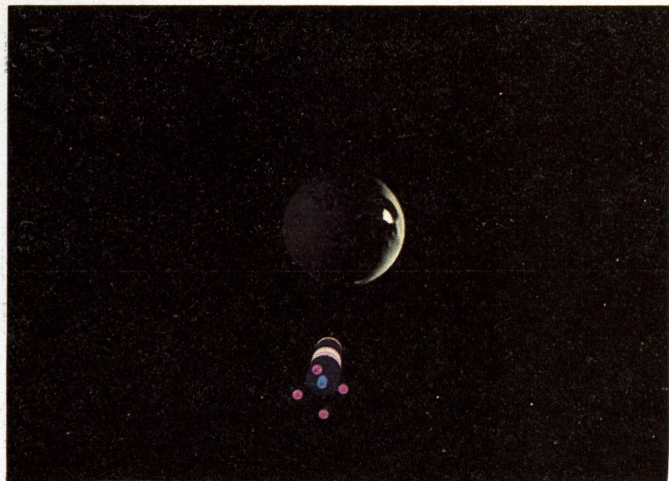
Ed Catmull and I met with Jim Veilleux a couple of times to discuss our involvement—to be sure Jim understood that we did want to do something for the movie but did not want to overextend ourselves. We were convinced that he understood this well. He proposed that the sequence consist of a zoom-in on a planet, a 2-dimensional razzle-dazzle of some sort to indicate an explosion

of the planet, a white-out to allow a cut to live action for reaction shots, and a zoom-out on the transformed planet. The proposal was made after he listened to us and watched some of our early effects. In particular, Pat Cole had shown Jim a great variety of computer graphics techniques already in use. He had chosen his suggestions to ensure ease for us and to portray a certain amount of stylization which the producers desired in the sequence. In particular, all of his suggestions could be realized 2-dimensionally. Although the structure of the shot was still very loose at this time, Ed, Loren Carpenter, and I had all thought that it would be nice to incorporate some of Loren's astonishing fractal techniques into it and mentioned this to Jim. A "fractal technique" is a method using controlled randomness to enrich a synthetic scene. The artist enters only a small amount of data. The fractal program automatically amplifies this to a large, natural-looking database. We were already starting to generalize the effects to something fancier than Jim originally envisioned.

It should be mentioned at this point that we had already done one "mini-production" (in August '81) for ILM to show off our abilities. We had rendered a model of the Starship Enterprise chasing a Klingon ship in 3-dimensions, with appropriate lighting, coloring, etc. This was done using Loren's first working version of his 3-D rendering program "Reyes" (Renders Everything You Ever Saw). This mini-production had also featured several 2-D effects programmed by Pat Cole and Rob Cook. We believe that this demonstration was what prompted Paramount and ILM to ask us to do a piece of the final film. In it

Continued on page 1048

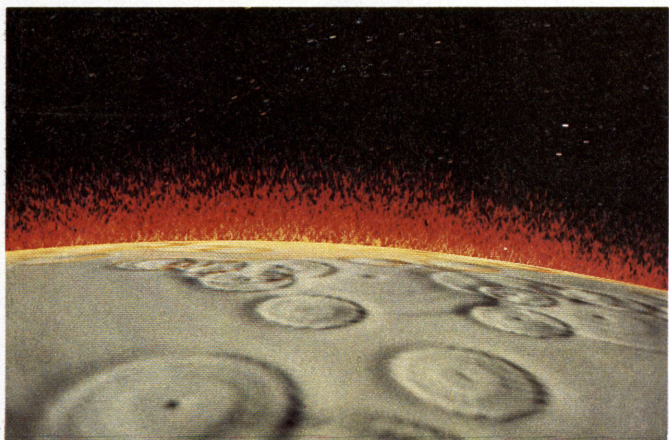
Advanced computer graphics created by Lucasfilm Computer Division simulate the transformation of a planet for the Project Genesis Demo Tape. Each frame in the 67-second shot is defined by an array of 250,000 pixels for display on a 500-line video monitor. Anti-aliasing techniques increase apparent resolution of image so that raster lines are barely visible in these VistaVision frames. Approaching a barren, moonlike planet, we see the Genesis torpedo racing toward target (A); impact, explosion, and shockwave (B); and a wall of fire consuming the planet surface (C). Flying lower, we see geological shapes forming as the planet cools (D); an earthlike landscape emerging (E); and, as we turn and bank to pull away from the planet, a primitive atmosphere forming (F). Complex landscape was created by Lorne Carpenter with complex mathematics requiring an hour of computer time to calculate each frame. Rapid pullback in (G) and (H) reveals final Genesis planet rendered by matte artist Chris Evans with electronic paint program developed by Tom Porter.



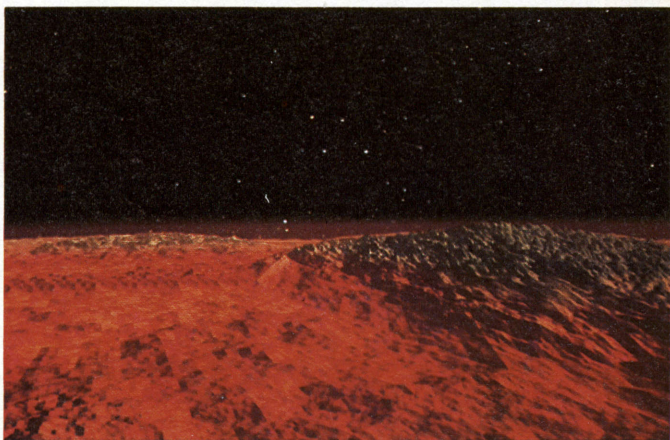
A



B



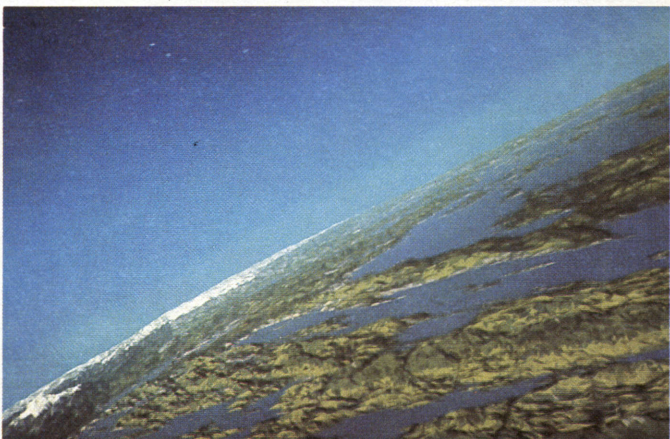
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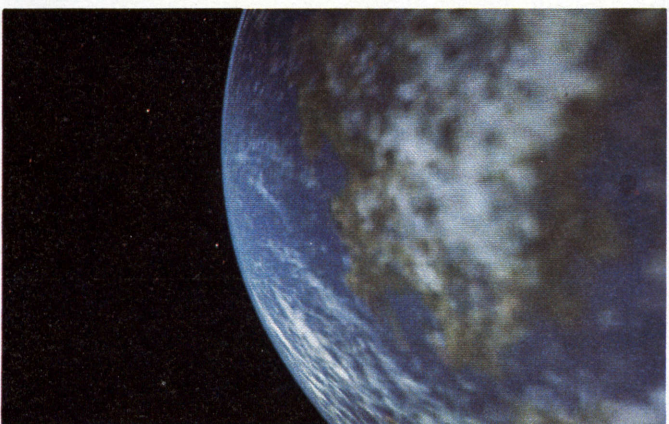
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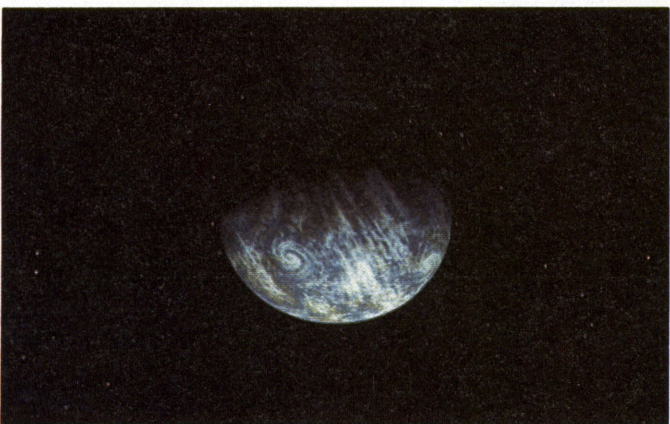
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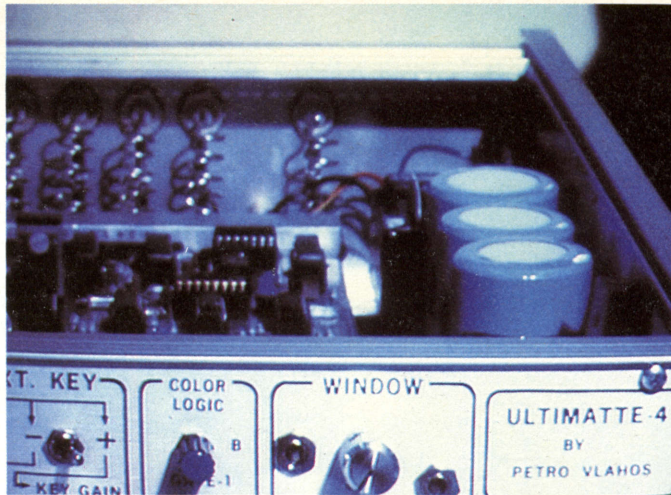
G



H



Foreground Direct



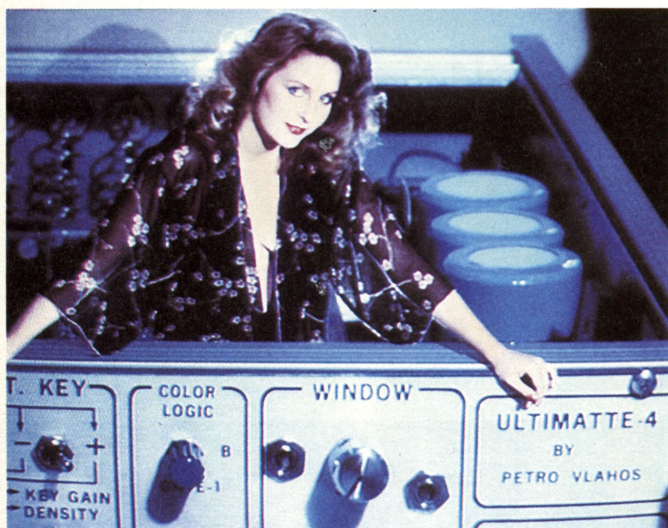
Background Direct



Processed Foreground



Matting Signal



Composite Scene



Processed background

Steps in the Ultimatte process: The foreground image is analyzed by means of the unique color logic of the system which is able to distinguish the pure blue of the backing from all other colors including natural blues with a certain amount of green in them. The processed foreground represents the foreground scene after Ultimatte has dropped the blue backing to black. The matting signal used to process the background is essentially an inversion of the luminance of the processed foreground. The processed background is created by adjusting the luminance level of the background in accordance with the matting signal. The composite scene is created by means of an additive mix (or superimposition) of the processed foreground and the processed background rather than switching back and forth between the two.

ULTIMATE[®]

by **RICHARD PATTERSON**

In the mid-fifties Petro Vlahos conceived the idea for an electronic matting system as part of his work at the Research Council of the Motion Picture Producers Association. At the time, however, not all of the electronic elements required for the system he conceived were available. He also perceived the system as a means of compositing film images and since there were no adequate systems for translating a film image into an electronic image and then back into a film image, he put the notion aside for the time being. In 1959 he invented the U.S. version of the sodium system for creating travelling mattes which gained 2 stops of light over the existing British system and eliminated all filtering of foreground set lamps. His initial sodium system was turned over to Disney, and he subsequently devised the color difference blue screen system first used on *BEN HUR* in 65mm. His work on image compositing systems was interrupted for a few years when the Research Council was disbanded in 1960, and then when the Research Center was revived, he was involved in work on the front projection system.

Eventually he returned to the idea of an electronic image compositing system and in 1968 he filed for patents for the system which is the basis for Ultimatte, an Emmy award winning video matting system in wide use today. At the time Vlahos was still primarily interested in using the system as the basis for an electronic film printer, and the MPAA solicited bids from various manufacturers for the construction of an electronic printer. One of the companies interested in bidding was Technicolor, which had

developed a video matting system called Technimatte at their Vidtronics division. Apparently some of the principles involved in the Technimatte system were similar enough to those covered by the patents for Vlahos's system that Vidtronics eventually abandoned their Technimatte system. No one ever constructed the electronic printer using Vlahos's system, but two other similar video matting devices were developed. One called Imagematte was developed completely independently in Canada. When its inventors discovered that the system had already been patented, they entered into a licensing agreement with the MPAA and manufactured some 16 units before giving up the license. Another matting system called R-matte was developed by an engineer who had been involved in the development of Technimatte at VIDTRONICS. R-matte employed some principles in common with Vlahos's system, but it was different enough not to be in violation of the patents and it enjoyed considerable success for a while.

When the MPAA Research Center was disbanded again Vlahos and his partner, William Gottschalk, took out a license on the electronic matting system and added several refinements to produce the Ultimatte which was introduced in 1979. Eventually Vlahos bought the patents from the MPAA, and recently his company introduced Newsmatte, a simplified version of the Ultimatte designed for live broadcast use.

Ultimatte differs from the chroma key process in a fundamental way and in order to appreciate Ultimatte it may be helpful to review the principles of chroma key. Keying is essentially a matter of combining two video

images into one image by switching back and forth between the two during the scanning of each frame (or field to be more precise). The simplest example might be a split screen which is achieved by switching each time the scanner hits a hypothetical line dividing the screen. It is also possible to trigger the switch with the brightness or luminance level for the image, i.e. whenever the luminance level exceeds a certain value the switch is thrown. This is called a luminance key and is used occasionally with graphics, but it is not really a feasible means of compositing live action images because of the restrictions it would place on the lighting of the foreground image from which the keying signal would be generated.

Chroma key is similar to a luminance key except that it is the chroma level of only one color component of the image which triggers the switch. Generally, the color used is blue and from a production standpoint chroma key is similar to the blue screen process used in film before the introduction of the color difference system in 1960. The foreground subject is shot in front of a blue backing and the image is composited with the background scene by switching to the background scene whenever there is a high enough level of blue in the foreground scene, i.e. whenever you have the relatively pure blue of the backing.

Like the original photographic blue screen process, chroma key has several limitations as an image compositing system. First of all there is a limit to the fineness of the detail which can be preserved in the foreground element. This is most easily apparent with hair and smoke. Because chroma key is a switching process

where the foreground is either on or off, there is inevitably a limit to how fast the switch can be and this determines how fine a line or point can be isolated in the foreground. A great deal of work was devoted to making the switch as fast as possible, but usually strands of hair or fine lines of smoke will appear to break up or disappear altogether when combined with a background via a chroma key.

One solution to the problem of the rendition of fine detail in a chroma key process is to take the reverse tack and slow the switch down rather than speed it up. The net result is a slight blending of the edges between the foreground and background since the one is gradually going off while the other is gradually coming on. This is called a soft edge chroma keyer and it eliminates the black matte lines sometimes associated with conventional chroma key as well as producing a more pleasing compromise in the handling of fine detail.

A second major limitation to conventional chroma key is its inability to reproduce shadows cast by the foreground subject. In many instances this may not be a consideration or shadows might even be inappropriate, but there are times when a realistic composite scene needs to have a shadow from the foreground cast onto the background. In order to achieve this it is necessary to selectively alter the brightness (or luminance) of the background scene to create the effect of shadows cast by the foreground subject. This can be accomplished by monitoring the luminance level of the blue backing and altering the luminance level of the background scene to correspond. If the blue backing used with the foreground scene is evenly lit except for shadows cast by the foreground subject, then the effect on the composited background will be that of shadows cast by the foreground subject. This is what is called a shadow chroma key and it was the basis for the R-matte process. It is still a switching process in which the image is composited by switching from one to the other but the luminance of the background is adjusted by reference to the brightness of the blue backing in the foreground scene.

Another advantage of this refinement is that a transparent or translucent foreground object will often produce a diminution of the luminance of the background resulting in a closer approximation of the effect

of a transparent object than is possible with conventional chroma key. If, for instance, a drinking glass shot against a blue backing is composited with a background in such a way that there is a shadow cast by the glass and the background behind the glass is slightly darker the effect may be fairly convincing even though the only parts of the glass actually keyed into the image are those places where there are substantial reflections on the surface. There are limits to how effective this can be, however, and part of what Ultimatte was designed to do was to solve the problem of how to matte transparent objects into a background scene.

Another significant limitation of chroma key which is overcome with Ultimatte is the presence of a bluish tint to the foreground subject as a result of blue light reflected by the backing or diffused in the lens. It is possible to light the foreground subject for a chroma key shot with straw gels on the lights to compensate for the blue reflected from the backing and to color correct the foreground scene before compositing it with the background, but there are limits to how effective this can be.

Finally, chroma key is limited by its inability to handle blue tones in the foreground subject. If some part of the foreground subject is blue enough it will be interpreted as part of the backing causing the system to switch to the background. The only really adequate solution to all these problems associated with chroma key compositing is to replace the switching operation with a different means of combining the two images, and that is what Ultimatte does.

Ultimatte uses an additive mix rather than an on/off switching process (or non-additive mix as it is called). Rather than having to choose between the foreground and the background signals, it processes the two in such a way that they can be added together or superimposed. In this way there is no switching on and off to capture a fine detail in the foreground, and transparent or translucent objects can be matted as well as opaque objects.

The treatment of the background scene is similar to the treatment of the background by a shadow chroma keyer except that Ultimatte is able to treat the background in an absolutely linear fashion. The luminance level of the background can be adjusted to any value from 100% of what it is in

the original scene to 0% according to an interpretation of the foreground scene. It is possible to "delinearize" the treatment of the background with Ultimatte in order to achieve certain effects, but for most work one of the strongest advantages of Ultimatte is the ability to control the luminance of the background in direct proportion to the brightness of the blue backing in the foreground scene.

The processing of the foreground signal is a much more complex matter based on an analysis of how best to distinguish the backing from the foreground subject. The method devised for achieving this is the principal subject of the patents on the system. It is essentially an adaptation of the color difference blue screen system used in film. Rather than simply measuring the level of the blue signal in the foreground image, Ultimatte measures the difference between the blue signal and the green signal. This is done for two reasons: 1) the blue backing is never absolutely pure blue and 2) there are often high levels of blue in portions of the foreground subject.

One reason blue is chosen as a color for backings in compositing processes is that pure blue is very rarely found in nature. In addition most natural blues have a higher content of green than red. It is therefore possible to set up an equation concerning the values of the red, blue and green components in the foreground signal which can be used to distinguish the backing from the foreground subject and enable the system essentially to replace the blue backing with dead black. It does this by dynamically clamping the blue to the green, i.e. by having the level of the blue in the processed foreground be a function of the level of green and the relationship between the three colors. If the difference between the blue and the green in the original foreground signal is great enough then the system takes all three colors to, zero to produce a dead black in the processed foreground. This is what happens to the portions of the foreground scene consisting of nothing but the blue backing. If the difference between the blue and the green is not that great, then the system limits the blue to the level of the green unless the green exceeds the red (as would be the case with blue eyes in the foreground subject). This enables the system to remove the bluish tint caused by the blue backing while at the same time

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allowing it to reproduce natural blues in the foreground. The only thing it prevents the system from doing is faithfully rendering magenta, which is a color in which both the blue and the red exceed the green. Magenta in a foreground subject will be rendered as red in the processed foreground or the final composited image with Ultimatte—unless one alters the system to work with a green backing in which case the limitation will be in its ability to reproduce yellow in the foreground. Except in very specialized cases, having magenta go red in the foreground is a very small price to pay for the compositing work that can be done with Ultimatte. It is also possible in most instances to release the clamp gradually to increase the blue content of a magenta subject to the point where it appears magenta without permitting excessive amounts of blue in other areas of the foreground.

It may be easier to grasp the way in which the foreground signal is processed if one begins by imagining a white card as part of the foreground subject being shot against the blue backing. Normally a pure white card would consist of 100 units of red, 100 units of green and 100 units of blue. If the card is being affected by blue light being reflected from the backing or by blue light being diffused in the camera lens, it will have a bluish tint in the unprocessed foreground, i.e. the level of the blue will exceed that of the red or green. Since the green does not exceed the red, the system will pull the blue signal down to the level of the green thereby removing the bluish tint to the card. It will now consist of equal portions of red, green and blue and be seen as white. In the same way, the bluish tint would be removed from the other colors in the foreground. Similarly if the foreground included a translucent object through which the blue backing was visible as a blue tint to the object, the processing of the foreground would eliminate the blue tint to the object while the system also turned on the background scene so that it would be seen "through" the foreground scene when the two were added together.

It should be noted that in order to process the foreground in this manner, Ultimatte requires an RGB signal. This can come from a live camera, a telecine or a component recorder, but it is difficult to derive an adequate signal by simply decoding a composite signal from a conventional videotape recorder. The background

signal does not have to be RGB for Ultimatte, so it is possible to work with a background scene on videotape. Newsmatte, on the other hand, is designed to work with a composite signal for the foreground as well as the background.

In addition to processing the foreground signal according to the color logic which distinguishes the backing from the subject, Ultimatte generates a matting signal from the foreground signal which is used to control the luminance of the background scene. This matting signal can be displayed on the monitor and appears as a black-and-white rendition of the foreground scene with the subject seen in silhouette and the backing as white or some value of gray. Where the blue level is at its peak, the matting signal is white; where the brightness of the blue backing is decreased either by shadows or translucent foreground objects the matting signal is a corresponding shade of gray. The matting signal then controls the luminance of the background signal as the foreground signal is added to it to make the composite image. Where there was no foreground object the background is seen directly; where the foreground is opaque it is seen directly; and where the foreground is translucent, it is superimposed over a slightly darkened background.

Ultimatte is an extremely flexible system which is designed to cope with real world problems in image compositing. The unit has 36 knobs and switches on the front for setting up and adjusting to conditions for a specific scene. Perhaps the most important of these is a clean up control which enables the operator to compensate for defects in the blue backing by delinearizing the treatment of the background scene. For instance, if there are seams or footprints on the backing, they will be interpreted by the system as shadows or some other way in which the foreground subject is affecting the backing; and they will appear in the composited scene as darkened portions of the background. In order to clean up these defects, the operator need only manipulate the matting signal so that it no longer distinguishes between the smudge or seam and the backing. Hopefully this adjustment need not be so drastic as to affect the rendition of the shadows cast by the foreground subject. In some cases, of course, it may be desirable to eliminate shadows cast by the foreground

subject so that they do not have any effect on the background scene and this is quite easily accomplished with the clean up control.

There is another set of controls on the Ultimatte which enables the foreground scene to be manipulated in a number of ways independently of the background scene. It is possible to adjust the contrast of the foreground scene so that it matches the background scene, and the foreground can be faded in different ways. It is possible to make the foreground go to silhouette or it is possible to make the foreground disappear and be replaced by an unadulterated background. The net effect of this latter process is to enable the foreground to materialize or vanish in a most natural (or supernatural) manner.

There is also a feature on the Ultimatte which makes it possible to overshoot the blue backing in shooting the foreground scene. So long as there is blue backing surrounding the foreground subject, the backing need not fill the frame entirely. There is a window control which can introduce an artificial blue backing to fill out the rest of the frame and the edges of this masking can be adjusted to suit the particular shot.

Another feature which offers interesting, creative possibilities is the fact that Ultimatte is set up to accept an external matting signal, i.e. it is possible to generate the matte with something other than the foreground that is being matted in at the time. One impressive application of this feature is a shot in which a person walks around himself. This is accomplished in two stages. First the person is matted into a background in the normal manner except that simultaneously the matte signal is recorded on a separate recorder. Then for the second time around a matte shot is set up with the first composite as the background scene and a shot of a person walking across the frame and back against a blue backing as the foreground scene. The matte signal from the first shot is fed into the Ultimatte for use as an external matte and a switch is flipped after the person crosses the frame in the new foreground shot. In one position the person will be matted into the shot in the conventional manner so that he appears to walk in front of himself and in the other position the person will be matted out of the shot so that he appears to walk behind himself.

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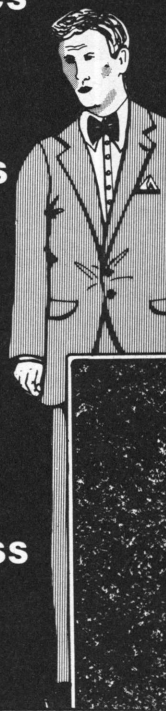
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All of this compositing is done in real time and the adjustments are made by tweaking knobs and watching a monitor. There is actually a 120 nanosecond delay introduced by the Ultimatte, which may be meaningless in comparison to days spent waiting for a shot to come back from the optical house but which is significant in the operation of broadcast equipment. This fact plus the fact that Ultimatte requires a separate encoder to convert its processed foreground back to an encoded signal which can be mixed with the encoded background, and the fact that the operator skills required for Ultimatte are more than can be reasonably expected of a technical director involved in a live broadcast, gave birth to the Newsmatte device. Newsmatte basically has only one control that is used after it has been installed. It involves only a 21 nanosecond delay and works with encoded signals.

Needless to say, there are some production considerations in working with Ultimatte. As with any system lighting is the key to obtaining the best possible results. The more even the lighting on the backing, the less it will be necessary to use the controls to compensate when processing the

foreground or generating the matting signal. Anytime a control is used to correct for a defect there is a compromise being made in some other aspect of the image. The color of the backing is more critical with Ultimatte than it is with chroma key—so much so that the manufacturers of Ultimatte have begun stocking the best paint for blue or green backings as a courtesy for their customers. Proper camera alignment is also essential in using Ultimatte. Improper alignment will result in fringing in the composited scene. The length of the cables for the red, green and blue signals for the foreground must be the same in order to avoid problems. All this means, is that like any sophisticated piece of electronic equipment, Ultimatte must be set up and used properly if it is to yield the best possible results.

While Ultimatte grew out of a desire to construct an electronic printer for compositing film images, no one has yet built such a device. Ultimatte could be adapted to work with high definition television or with a scanning system designed to duplicate the resolving power of film. It would take some engineering work but it would not require any real innovations. The result would be an incredibly versatile

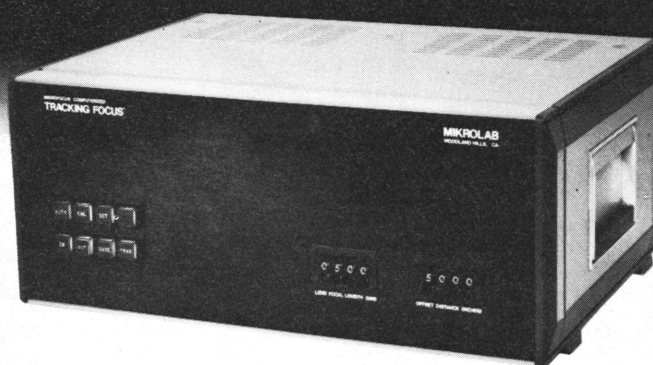
printer in which the electronic manipulations of the image take place in real time. The only limiting factor would be the time required to scan the original film image and to record the composited image onto film. There are also plans to manufacture a digital version of Ultimatte as soon as as equipment is available to provide digital signals.

Ultimatte has been used on film productions, however, as a preview system for blue screen photography. Using an Ultimatte with a video camera on the set to evaluate the lighting and staging of a blue screen shot can save a great deal of time and result in a much more successful shot. Not only is it possible to preview the fully composited shot if the background has been transferred to a video-cassette beforehand, but Ultimatte can also display a video version of the black and white mattes that will have to be generated from the color negative. Problem areas can be quickly spotted and corrected before the scene is committed to film.

For further information about Ultimatte, contact Ultimatte Corporation, 18607 Topham Street, Reseda, California 91335, telephone (213) 345-5525. ■

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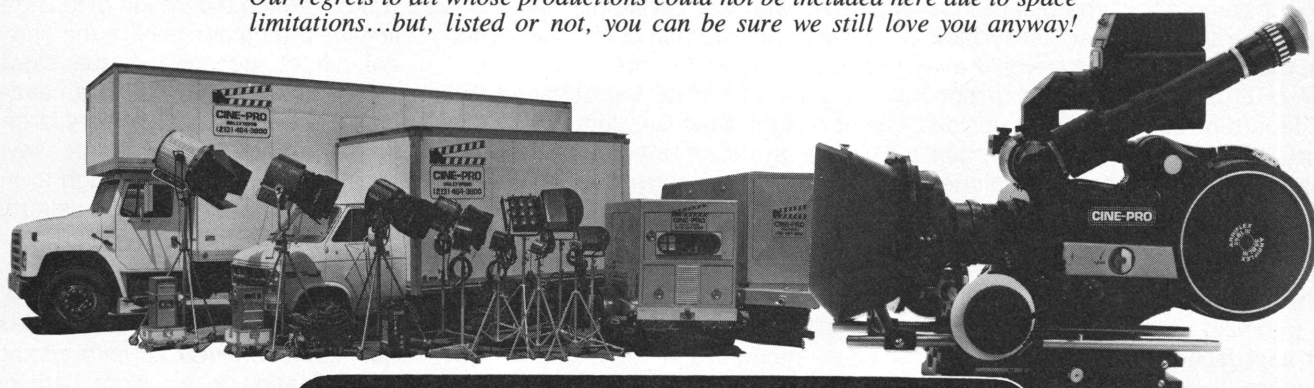
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Our regrets to all whose productions could not be included here due to space limitations...but, listed or not, you can be sure we still love you anyway!



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we practiced our rule of "no aliasing" and hopefully convinced the Lucas-film people that we meant it. Aliasing in one of its more pernicious forms is sometimes referred to as the "jaggies." This is the look of little boxes or stairsteps which has plagued the early days of computer graphics. Unfortunately and erroneously, some people equate this look with computer graphics. It is like assuming the flicker of early movies is the nature of film.

Over a hurried lunch before a meeting one day with Jim Veilleux, I came up with a proposal for the Genesis Demo sequence which stretched our capabilities at that time and satisfied the ST2 requirements by supplying quite a bit more to them than requested. I suggested using the JPL-style planetary flyby as metaphor. JPL (Jet Propulsion Laboratory, of CalTech) had just successfully flown the pair of Voyager spacecraft past Jupiter and Saturn, with computer simulations by Jim Blinn frequently shown on national television. The idea was that we could get away with quite complex camera moves because people were now familiar with strange angles from having been exposed to these flybys. The computer simulations of the flybys came to mind readily because Jim Blinn had spent a short time as part of our group before deciding to return to JPL several months earlier.

The full idea was that our imaginary camera would be attached to an imaginary spacecraft approaching the dead, moonlike planet from below. It would swing about the planet in a parabolic trajectory near its surface while the on-board camera would execute a large spiraling move to portray departure from the planet upside down—i.e., from above. The portion of the trajectory near the planet would last long enough and be close enough to show off the fractal mountain-building effect on its surface, then pull away revealing the resulting live, earthlike planet. As the spacecraft approached the dead planet, it would fire a sperm-shaped projectile at its surface to bring it to life then fly over the resulting chaos and eventual mountain-building process. The "chaos" was as yet unspecified but I envisioned something like the Jovian Red Spot turbulence seen by the Voyager flyby of Jupiter and lots of exploding volcanoes where the craters

formerly lay (as inspired by a painting by Don Davis).

I presented these ideas to Jim Veilleux and then to the Graphics Project to see if we could actually implement them and to ask for alterations and suggestions for the "chaos." The principal alteration at this time was to invert the camera move so that we approached the planet from above, departed from below. There was quite a bit of debate as to whether this motion was too dramatic or not. I argued that what would be happening on the surface was so overwhelming that the long twisting camera move would only be icing on the cake for those who chose to notice. The results of this first meeting were that Rob Cook would write the texture-mapping program which would be used to surface the planet, Tom Porter would write the paint program for generating the textures on the planets and the compositing program for combining elements generated by other programmers, Loren Carpenter would build the mountains with his fractals, Ed Catmull and Tom Duff would do motion-blurring, and the "chaos" would be decided later.

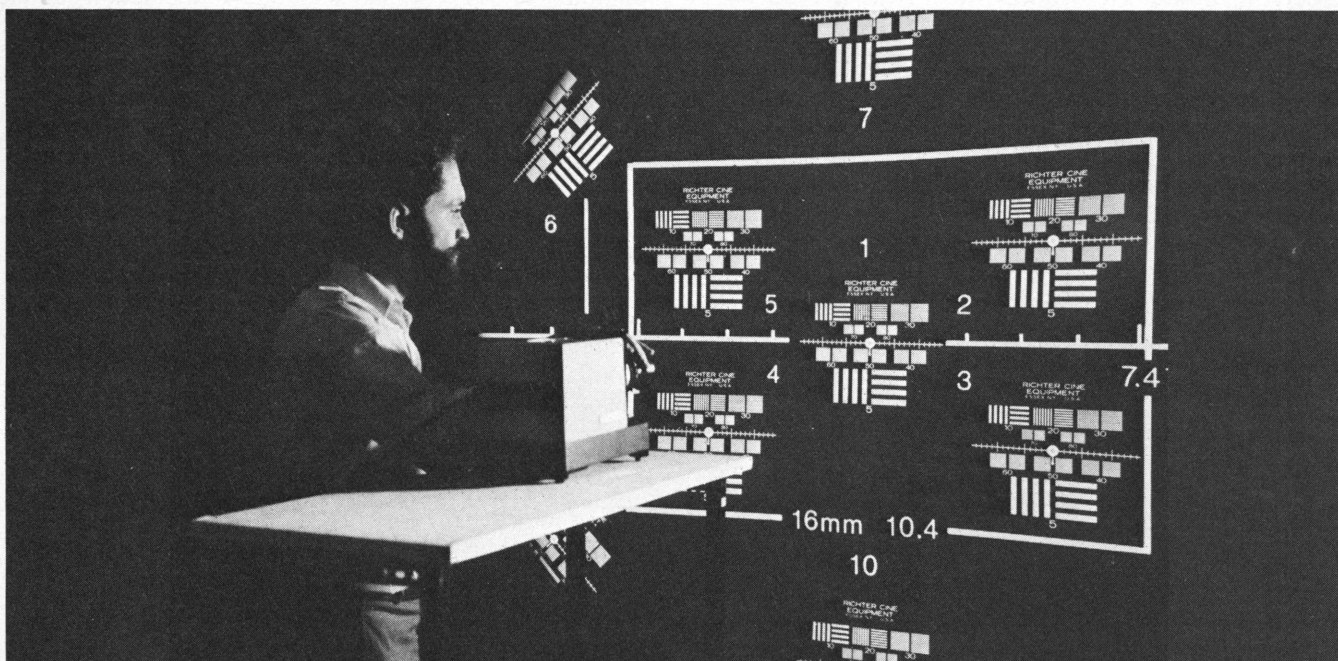
Loren also took on the task of designing a flight path with a realtime geometric modeling program by Bill Reeves. This program, which runs on the E&S Picture System, represented the sphere by a wireframe. Loren was later to add indications to this planet representation for projectile impact point, its antipode, the terminator, and the polar cap which was to be the location for fractal mountains. He also represented several of the mountains. He designed dozens of flight paths, with me constantly kibitzing, using 7-dimensional cubic splines for smoothness and grace.

During this time, we obtained the Yale Bright Star Catalogue of 9100 visible stars of magnitude 6.6 or brighter. Loren converted the given database into xyz coordinates and deduced the colors of the individual stars. He had the notion of choosing a location for the Genesis planet in a part of the heavens which would place recognizable constellations in the background. He and I perused one of my astronomy books and came up with the five nearest stars for which there is some hope for existence of life. From one of these, Epsilon Indi, Loren determined that the Big Dipper would be visible in a form not too distorted from our Earth view of it. Furthermore, our sun would ap-

pear as an extra star in this constellation! As an extra bit of icing on this exercise, Loren went to an atlas, found the Indus river and the city at its mouth into the Indian Ocean. This city is Keti Bandar, which we took as our local name for the Genesis planet.

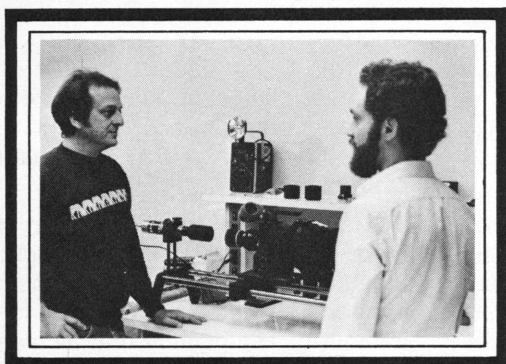
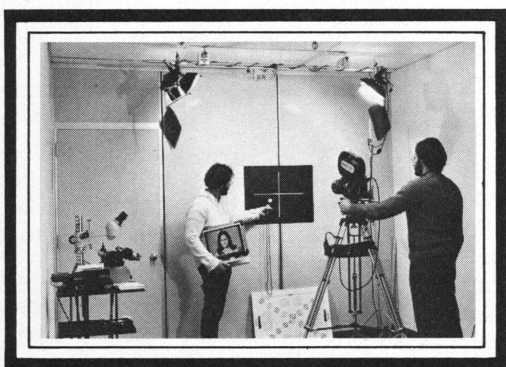
Meanwhile I had asked Tom Porter to design a volcano-exploding program based on a softened line drawing routine he had already successfully implemented. I still did not quite know how to handle the transition from impact of projectile, to "chaos," to fractals. I was quite surprised when several days later, Bill Reeves, instead of Porter, came up with the fire rendering program. Bill's move was surprising because, although he had done a fine job of writing a black-and-white line-drawing package for the E&S Picture System, I had no idea he was interested in color images or raster-device images. I was delighted to learn that he wanted to make images as opposed to just building the tools for making them. (This has proved to be a characteristic of almost everyone in the Graphics Project.) He animated a few preliminary fires which were very beautiful and inspirational.

One night, getting quite frustrated that the "chaos" scene was not coming together, I sat down with Loren to brainstorm a solution. Since Bill had just demonstrated his fine fires it was clear these should be used somehow. We did away with the exploding volcanoes and came up with the notion of an expanding ring of fire which would spread like a prairie fire from the point of impact of the projectile melting the surface of the planet in its wake. I added the notion of losing the fire for a moment behind the limb of the planet, because of the camera move, and then having it dramatically reappear, very close and very large to swoop across the screen conveying great heat and fury—enough to melt a planet. Loren suggested using this racing wall of fire to sweep our attention across the planet in a swooping pan to the mountain-building portion. This was to be our transition sequence. It required Loren's adding a fire indication to his flight path program to allow us to choreograph the spread of the fire and time its sudden reappearance from behind the limb of the planet. As it turned out, Bill required a quite complex 10-step matting process, using Tom Porter's matting program, to achieve the desired effect.



A man with a beard is looking at a large test chart. The chart features several resolution patterns, each labeled with a number: 1, 2, 3, 4, 5, 6, 7, 10, and 16mm. The patterns consist of horizontal and vertical lines of varying thicknesses and spacings. The man is standing at a desk, and the chart is mounted on a wall or a large board.

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Loren solidified the fractal sequence into its final form about this time: a cooling of the red hot liquid surface caused by the wall of fire, cooling through the yellows, reds, oranges, to gray while mountains begin to grow through the haze also created by the fire. This haze would later become the atmosphere of our final earthlike planet. The imaginary spacecraft would be speeding at 50,000 to 100,000 miles per hour across this forming surface. As the mountains reach their final altitude (Everest-like), oceans would rise to sandy shores, greens would spread, and snow appear on the peaks. Rob Cook supplied the color coordinates of these natural elements and found atmospherical models from which Loren later derived his atmosphere generation program.

Meanwhile, Rob's texture-mapping program became such a large project that it was clear that it would not be done in time for completion of the Genesis Demo sequence. So Tom Duff took on the task of writing a special purpose texture mapper for spheres. He eventually wrote a very difficult piece of code which preserved sharpness at all distances, was completely antialiased, supported local lighting of the surface by the wall of fire, and used "bump mapping" for pseudo-3D roughening of the surface of the cratered dead planet. His progress was slowed by an unfortunate fall, from a stage set, which broke his wrist. He wore his cast for the Christmas "holidays," which were not holidays for the Graphics Project. Our two large computers (VAX's) cranked day and night during this period on the fractal portion of the sequence, which eventually used about a month of computer time.

The beginning of the year 1982 found the fractals mostly done, and we began a race against the clock to finish the sequence by March 19. By this time, several rough tests had been shot and shown to both Jim Veilleux and Bob Sallin, the STAR TREK II producer. They were pleased with our work and very encouraging. Tom Porter had taken on the starfield generation program with motion blur. He also finished up the paint program. Bill Reeves continued to refine his fire generation code. Some of his fires required tracking a half-million fire particles through individual trajectories and incandescent color changes. Loren and Pat Cole added a shock-

wave sequence to the impact of the projectile, which was required for story continuity. Pat modeled the projectile on blueprints we received from ILM, using Bill's modeling program. Loren designed his atmosphere generation program. Tom Duff struggled to complete his texture mapper for spheres. Ed Catmull tried to make time in his busy managerial day to finish the motion-blurring program. I rode herd. Our group hardened into a team because of this experience and gained its first real production experiences as part of Lucasfilm.

We unveiled Tom Porter's paint program to the ILM matte artists Mike Pangrazio, Chris Evans, and Frank Ordaz in early February to their rave reviews. Chris proceeded to paint the earthlike texture map which was mapped, using Tom Duff's program, onto the surface of a sphere to create the final live planet.

A preliminary shoot on February 19 revealed several weaknesses in the sequence: moire in the cratered planet surface, loss of the stars because of overly "hot" foreground elements, unconvincing sweep of the fires across the planet, popping fractal polygons, miscellaneous blown frames, etc. Ed rushed to finish up his motion blurring program to alleviate the temporal aliasing. Rob Poor had his retinas photographed and digitized. (Actually four of us had our retinas photographed as a laser safety measure but Rob's retinas were the most interesting.) Pat, Loren, and I began serious discussions on the retina ID sequence which we planned to keep simple to fit into the remaining time. The principal idea was to tile the digitized retina photo with tiles of various sizes. Then we would move a vein template around over the tiled photo in an interesting way until a pattern match occurred, at which point some appropriate lettering and graphics would appear, indicating positive identification, and we would be done.

The filming of the final piece was performed by a film crew from ILM using the Empireflex VistaVision camera. ILM crews also shot three preliminary versions of the sequence during the course of this history. But the task of providing "dailies" (more like weeklies) for us was accomplished by David DiFrancesco, who purchased and installed a 16mm Bolex, and Rob Poor, who designed and built a straightforward computer interface to this camera. This same interface was

used also to drive the 35mm cameras from ILM on the "official" shoots. David also built a video scanner rig which was intended for digitizing the retina. The digital component of this assembly came from an outside manufacturer who was so late in delivery of a working version that the scanner was not finished in time for the shot. It is being readied for use in future work.

A word about the other equipment used, manpower, and computer power is in order. The VAX computers and E&S Picture System have already been mentioned. Other principal pieces of equipment were two Ikonas framebuffers, a Barco monitor, and a Hitachi tablet. It is estimated that we invested about 2 man-years of effort into this 80-second piece (60 seconds for the Genesis Demo and 20 seconds for the Retina ID sequences). There is no easy answer to "how long does a frame take?" except "it depends on the complexity of the scene." Some frames required five minutes, some required five hours. The Graphics Project hardware staff, headed by Rodney Stock and including Gary Newman, Adam Levinthal, Lane Molpus, and Glenn Sharp, is hard at work designing the Pixar, a machine to increase the speed of computing our frames by two to three orders of magnitude. Similarly, David DiFrancesco is constructing the laser-based input/output devices for the Pixar to greatly increase the resolutions at which we can work. The Genesis Demo task and its restrictions have underlined the importance of completing these projects.

Principal credits for the computer graphics on STAR TREK II should go to Loren Carpenter (fractal mountains, atmosphere, shockwave), Pat Cole (projectile, retina); Tom Duff (cratered sphere, texture-mapped sphere); Chris Evans (painted the pull-away planet surface); Tom Porter (stars, compositing, paint); Bill Reeves (fires); Alvy Ray Smith (concept, direction).

I like to think of the group as an off-line rock group. We work very tightly together on our individual instruments for months, and only later do we face the music. The point is that all members of the team are creative contributors and a project requires all of them. A drummer is absolutely necessary but a fantastic drummer cannot carry a piece alone. ■

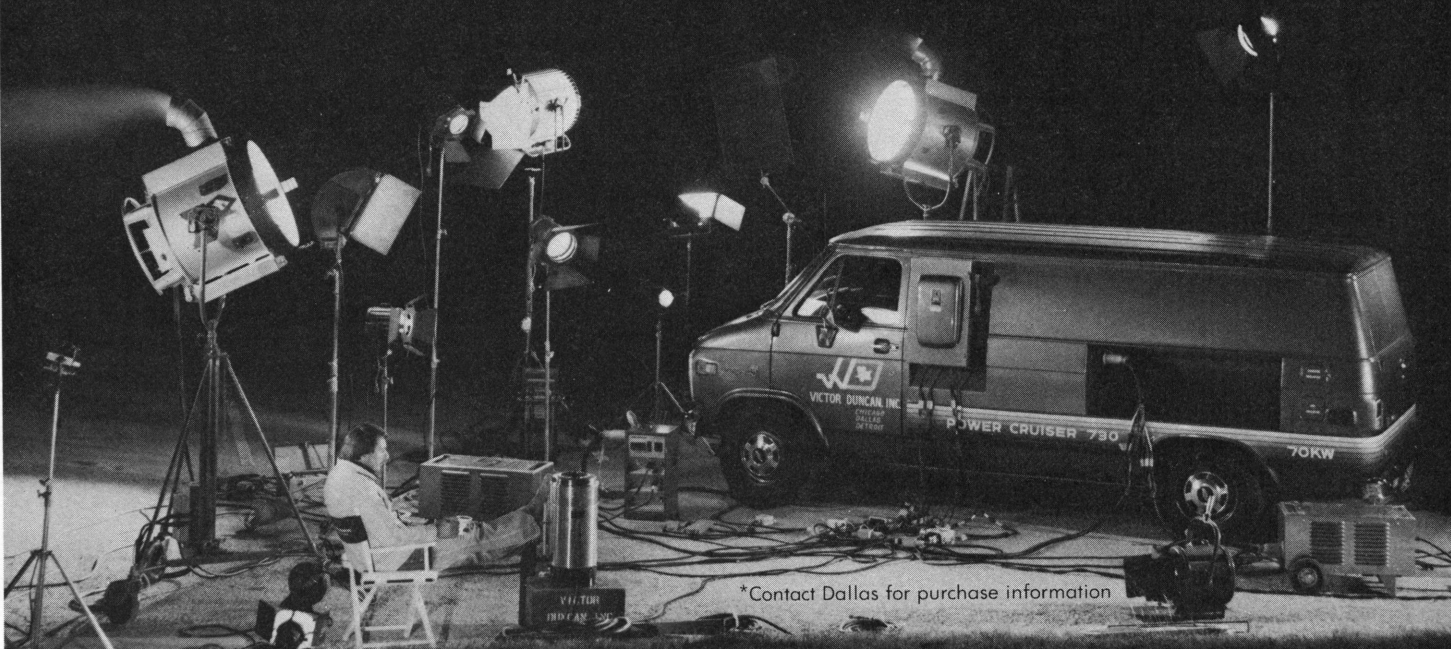
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Continued from page 1037

Enterprise and the Reliant are hit by phasers causing severe injuries. The hit on the Enterprise was achieved by animating (actually painting) the scars from the phaser on the body of the model, then using the same timings, we shot a glow pass on the model. A small light on a rheostat was moved across the ship at varying exposures. After all was done on stage, Sam Comstock and the animation department took our footage and enhanced it with explosions, sparks and the phaser. The damage on the Reliant was done by using miniature and high-speed photography. The late Bruce Hill shot all our slo-mo effects, and did, as usual, a great job.

The rear dome of Reliant, which was hit, was built of wax and break-away glass, and filled with a network of wires and explosives by our in-house pyro genius Thaine Morris. We shot a lot of 16mm tests in the early stages, using the action-master camera. This helped immeasurably to narrow down the look we wanted, and how we would approach it technically. After the tests, we brought Bruce in and shot all our explosions (360 frames a second), in one very well organized day.

Rose Duignan did a fabulous job coordinating all the different factors of our part of the production. It's one thing to try to just do the work, but organizing what model goes to what cameraman when, who flies to Los Angeles tomorrow, who returns tonight, etc. is a near impossible task. I think she must be cloned into ten different people, because one couldn't possibly handle it.

The sequence in the nebula is the most visual part of the film. Ships maneuvering, playing cat and mouse deep inside the colossal Mutara nebula—a battlefield of huge, swirling gases, and explosive energy. Getting the "look" of this alien environment was very important, and much time went into experimenting with various approaches, materials, unusual compounds, any and everything to achieve what we wanted. Chemicals might work, or matte paintings, but still they weren't quite it. Finally, Don Dow and crew came up with an answer. By using a solution of latex rubber mixed with ammonia, and injecting it into a mixture of salt water and fresh we created incredible abstract shapes that constantly were moving and changing.

The constant movement was what made it so interesting to look at, and so damn difficult to photograph. Since the latex was white, all the colors were done with gels on the lights. After the mix was placed in the tank, and currents to shape it created, it was a matter of standing back and letting the stuff do whatever it wanted. Certain shapes lent themselves to certain colors and combinations of colors. It was like playing Beat the Clock. Once the clouds formed, I'd determine what color scheme worked best, what went where; and while I was yelling directions, the crew raced to set lights just right, put just the right gel and scrims on them, then we'd set the shot up, quickly determine exposure and the amount of time per frame of film (5247) and, most important, cross our fingers. If we weren't fast enough we'd miss it. Generally after several takes, the cloud tank would disperse too far to continue, and we'd have to empty and clean it, then refill it to try again.

It was difficult maintaining any sort of continuity with this abstract system, and we had to shoot a lot of film to give us enough material so I could give the nebula sequence a cohesive look from shot to shot. One nebula shot in October would have to cut with one shot in January: colors, shapes, the works. The occasional energy blast inside the nebula was accomplished by moving an inky around the tank, shining the light in different areas of the clouds, altering its intensity from frame to frame. Any additional light effects, such as the sensuous energy auroras, were done in the animation department. Sam Comstock reflected light into strips of mylar, then onto a rear projection screen, and shot them at very slow speeds.

The ship models were lit differently in this sequence. They all were lit to match the bizarre colors of their backgrounds—yellows, reds, orange, etc.; each scene a different color scheme. Lighting ratios were increased to heighten the drama of the nebula and more backlighting was used.

After all elements for a specific shot were complete, they'd go into our editorial department. Art Repola handled my sequences, and finessed all the timings of ships, explosions, nebulas, etc. He'd take all the separate pieces of film, sync them up for maximum effect, then send them to optical to be composited together.

The last problem to solve was filming "Spock's coffin" on the tropical virgin Genesis Planet. Of course, virgin anything these days is hard to find, so we had to create it. Because of limited time, we went to nearby San Francisco and beautiful Golden Gate Park. We scouted out the park, and found a tropical, overgrown area, not too far from ILM, and planned the shoot for that spot.

Stu Barbee was operator, Owens assisting. Our grip department, headed up by Ted Moehnke and Pat Fitzsimmons, moved us in and handled the equipment and the tulip crane we used.

We shot on Fuji and used the Panaflex with assorted lenses. The crew shot from 3 a.m. to 7 p.m., moving around the park, making sure we got the shots. This was due to the fact that we were nearly out of time, especially for reshoots. Thaine Morris smoked the park up to add a primeval ambience. We had greensmen place extra ferns around to accentuate the lush surroundings of the park, a few HMI's were used to help the sun, back reflectors were our fill and a fiberglass coffin our "star."

After the location shoot, we added a scene of clouds taken from the stockpile we acquired for DRAGONSLAYER and put in a matte painting by Frank Ordaz to start the sequence off.

We managed to complete all the effects within our budget, and on time—which was a task all its own. Each job is a new challenge, and it makes for an interesting, sometimes exciting way to make a living. ■

November's Cover Story:

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Cinematography
by
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source for virtually all star field backgrounds in the film, including the closing shot.

Programmer Steve McAllister went to work writing a very sophisticated Fortran program that would turn Digistar into what amounted to a true motion control system. Once photographic problems were solved, the system turned out to be so efficient that 10–15 different star field backgrounds could be produced in one day of shooting. By manipulating joystick knobs we could specify a starting position in the star field, then set the roll, pitch, and yaw of the camera viewpoint relative to the line of motion. Any of six degrees of freedom could be moved during the shot, so that pans, rolls, tilts, and tracking moves could be made through the star field. The velocity of the move could be linear or follow an acceleration curve during the shot. This made it possible to do slow-ins and slow-outs to coordinate with camera moves on miniature ships or planets. Once the move was previewed in real time, one had only to specify the number of frames and the frame rate at which the camera would be set, and the Digistar computer would play back the move at the slower speed. The refresh rate of the video display remained a constant 60 times per second real time; so the exposure of the star field remained constant during an acceleration into fast blurred motion. In addition to these parameters, the angle of view could be specified to simulate normal or wide angle lenses.

All of the digital data needed to reproduce the shot could be stored on floppy disk and recalled in seconds for reshooting. And since the computer always kept track of its exact position within the star field for the beginning and end of a shot, different simple moves could be shot separately and then jump cut together on the optical printer to produce a continuous complex move. Such was the technique used to create the final shot of the film. It consists of five different programs cut together, the final one being an accelerated trucking move out past the edge of the data base. The middle portion of the shot has a disorienting camera roll that peaks at a fairly high speed. To reduce strobing effects on the screen, this portion of the shot was streaked in the camera by allocating more time

to shutter open than to shutter closed in each frame cycle.

The main title star field turned out to be a continuous 3,840-frame move through the Digistar data base with subtle rolls back and forth and a velocity curve calculated to stretch the move as long as possible before running out of stars. The angle of view was set at 140 degrees to give the move a dynamic wide-angle look. The shot was photographed in VistaVision with a Nikon 135mm at f4. With the camera running at 0.75 fps to get a $\frac{3}{4}$ -second exposure, the shot took one hour and 36 minutes to run.

The main photographic problem in reproducing the computer star fields was finding and repeating the combination of brightness and contrast on the monitor that would yield the best results. Another variable, set by joystick, was the degree of "depth cueing" assigned to the image; i.e., the difference in brightness between near and far objects on the screen. Brightness and contrast dials on the monitor were so sensitive that just nudging one of them would make a noticeable difference in the quality of the image.

If the background stars—quite small on the high-resolution display—were too bright relative to the foreground, the image would look flat. If they were too dim, the smaller ones wouldn't produce enough density on the negative to survive optical compositing later. Furthermore, any stars that were too heavily exposed on the negative would come out too large on the screen, destroying the credibility of the shot.

ILM's portable VistaVision projector was used in the early shooting sessions at Evans & Sutherland to help iron out some of these problems. Viewing a second print and inspecting the negative at ILM, optical photography supervisor Bruce Nicholson would phone in his evaluation of the image quality for each take. Once the optimum look was established, we related it to a gray scale grid generated by the Digistar software on the display. The leverage of the gray scale readings over the final exposure was so great that a difference of 0.1 EV measured with a spot meter would significantly affect what was recorded on the camera negative. Even with this quantitative aid, the overall depth cueing had to be "eyeballed" in.

Steve McAllister applied what he had learned in developing the star

field program to the task of creating tactical displays for the *Enterprise* viewscreen during the simulator scene that opens the film and later when the *Reliant* and *Enterprise* are orbiting opposite sides of Gamma Regula. Data for these images was displayed on the Evans & Sutherland color picture system—a 4,000 x 4,000 video display with color phosphors. For the viewscreen tactical that guides Lt. Saavik through the *Kobayashi Maru* exercise, objects like the revolving navigation symbols, the Klingon neutrality zone, the tiny *Enterprise*, and other symbols and letters had to be constructed of thousands of straight lines called "vectors" connected together to form continuous shapes. Each line was defined by the computer as two dots in space, their positions recalculated several times per second during a move.

Although cut into short pieces to work with the live action footage, the *Kobayashi Maru* tactical was developed as a continuous 30-second shot. With the tiny *Enterprise* (a 2,700-vector model) positioned inside revolving navigation symbols, we first see an objective view of its position relative to the distant Klingon neutrality zone and the distress symbol for the *Kobayashi Maru* inside. Then, as Lt. Saavik orders the ship to plot a course toward the *Kobayashi Maru*, the viewpoint of the tactical changes to move inside the navigation symbols and replace the *Enterprise*. The result is a subjective view of the *Enterprise's* approach and passage through the neutrality zone boundary.

A photographic problem associated with the tactical displays stemmed from the fact that the peak responses of color phosphors on the display didn't match those of the 5247 camera negative. A tedious process of trial and error was required to set the brightness, hue, and saturation of each object in the scene. Then the overall brightness, contrast, and depth cueing levels were set for the best response on film. Once completed, however, each tactical was a single VistaVision element that could be matted into live action plates of the *Enterprise* bridge.

The remarkable DNA molecule used to explain the Genesis Effect to Admiral Kirk was another example of vector graphics developed on an Evans & Sutherland color picture system. Its author, Dr. Robert Langridge, had spent years developing and refin-

ing the model for use in pharmaceutical research at the University of California, San Francisco. We photographed two different versions of the molecule, and animator Scott Caple joined them together with an explosion of shock waves and "molecular energy." The result is a move into a symmetrical crystalline structure that becomes transformed into a complex organic-looking molecule.

Probably the most sophisticated effect in *STAR TREK II* is that shot in the Genesis demonstration tape that shows a dead, moonlike planet being transformed into a life-supporting world with earthlike landscapes and atmosphere. Originally the effect was to be presented as a laboratory demonstration. An inorganic block of matter was to be put inside some sort of pressure chamber where, through special effects, it would be transformed with a burst of energy into a large flower. I suggested that the scene be replaced with a computer simulation of the Genesis effect taking over an entire planet. It was easy for Paramount to see that this might work better dramatically, but they were concerned about the quality of the simulation; they wanted it to be considerably more impressive than

what might be achieved through conventional animation. This was an understandable concern, since there were very few examples of computer graphics in feature films at that time I could point to as a reference. Having seen bits and pieces of research being done by Lucasfilm's Computer Graphics group, I was convinced they could produce something really innovative that would satisfy the dramatic requirements of the story. (See Alvy Ray Smith's article on the computer graphics work for the film.)

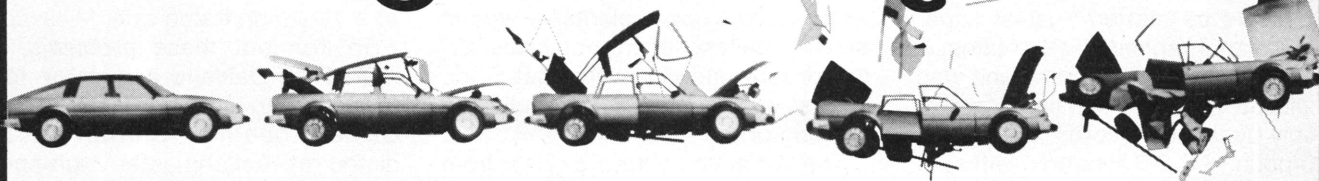
Many of the effects in *STAR TREK II* involve a live action scene combined with animation, matte paintings, miniatures, or computer graphics. Special care must be taken in shooting the live action element to insure that the final optical composite will cut in with footage shot by the production camera. Because of the inevitable loss of resolution that occurs when an original element is rephotographed through the lens of an optical printer, the live action plate is usually shot in a larger format such as 65mm or VistaVision to compensate.

At the ILM facility, nearly all production and post-production gear is set up for shooting original elements in VistaVision and then reducing them

through an anamorphic lens on the optical printer to produce a Panavision dupe negative composite. VistaVision is 35mm negative run horizontally through the camera at 8 perforations per frame. The versatile format allows the use of Nikon lenses, and the image can be repositioned vertically in the printer.

A vital requirement of live action elements, or "plates," is that the image be extremely steady from frame to frame, so that it will not appear to jump about when composited with an effects element. Most of the live action plates on *STAR TREK II* were shot with an enormous VistaVision camera originally built for Paramount Studios in the early 50s when Hollywood was trying to put bigger, sharper pictures on the big screen to compete with television. When assembled in its sound blimp and mounted on a tripod, the unit weighs about 400 pounds and requires four people to move it. With its Mitchell movement finely tuned by the ILM machine shop and the large loops that lead the film in and out of the gate, the camera produces extremely steady images. In most effects shots, particularly those involving matte paintings, the slightest unsteadiness

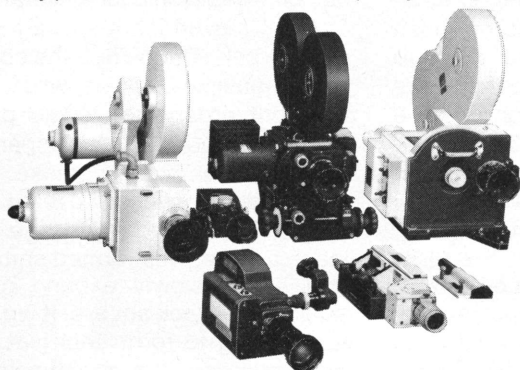
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can render the live action plate worthless for compositing.

Effects cameraman Scott Farrar and assistant David Hardberger, in addition to photographing dozens of miniature elements for the film, were responsible for running the giant camera. Typically the team would wrap up shooting a blue screen element on a motion control system at ILM, fly down to Hollywood that afternoon to set up the big VistaVision camera for a live action shot on the *Enterprise* set, then travel to Salt Lake City the next day to shoot computer graphics at Evans & Sutherland with yet another VistaVision camera system. What made this kind of schedule possible, in addition to the versatile skills of the two cameramen, was the fact that each of the ILM cameras, although quite different from one another mechanically, had been fitted with a servo motor and a standard battery-powered control unit designed by Jerry Jeffress and Kris Brown. The computer-based control units drive all of the cameras at sync-sound speed and at just about any lower speed and operational mode desired. Animation work, streaking, and time-lapse photography can all be done in the field with these units, and most of them are compatible with the motion control rigs installed at ILM to shoot miniatures.

In order to isolate actors so that they could be matted against separately photographed backgrounds, a special portable blue screen unit was employed. Attached to a heavy power supply by umbilical cord, the unit is a 200-pound AC-DC light box with special fluorescent bulbs illuminating a 6 by 8-foot Stewart blue screen. In the underground cave set where actors were to be dematerialized by phaser fire, we used the portable blue screen to isolate the victim as a separate film element. First, all actors in the scene were rehearsed to establish marks and timing. (Jedda, in the foreground, was to be hit by phaser fire from Terrell in the background as Lt. Saavik shoved David out of the line of fire.) Then Jedda, the foreground victim, stepped out of the scene, and everyone else was photographed to record the background VistaVision plate. To produce the foreground element, the background actors and props were removed, and the blue screen was slid into place (with just an inch to spare on the low-ceiling set!). Jedda assumed his rehearsal mark in front of the blue screen, and

the VistaVision camera recorded his reaction to the phaser hit. Weeks later, animator Kim Knowlten created a disintegration effect with airbrush artwork that matched Jedda's position frame by frame. The effect replaces Jedda in the final composite via optical dissolve.

Much of the success of this technique was due to Director of Photography Gayne Rescher and his crew. They were able to protect the blue screen from stray illumination and still light the actor so that he would match the background action—all in an extremely cramped setup.

To produce the three matte paintings for the Genesis cave, artists Chris Evans and Frank Ordaz worked from a basic concept devised by Joe Jennings, production designer and art director Mike Minor. The concept involved a giant cavern beneath the surface of Gamma Regula that had been created by the Genesis team in a single day. It contained its own light source, waterfalls, lush prehistoric vegetation, and a profusion of rock bubbles that had formed from the intense heat of the explosion and cracked into fragments during cooling. It is on one of these "lava bubbles" set into the wall of the cave that Kirk and his party appear to view the Genesis cave environment. The big lava bubble set was constructed on Stage 5 at Paramount and dressed with rented tropical plants. It was lit by Gayne Rescher to match the diffused early morning light that Chris Evans was using for his full-view painting of the cave.

The live action plate was shot from a 30-foot platform with the big VistaVision camera. The negative from the selected take was immediately composited with a field chart grid on the optical printer at ILM to insure sufficient steadiness before the set was struck. Then Chris Evans created a matte painting on glass to surround the area where the live action plate would be projected, extending the lava-bubble and lush vegetation motifs to blend the two elements together and hide the matte lines. In the distant background, he painted a wall of cascading waterfalls. To create the sensation of moving water, he attached cotton to a motorized roller behind the painting, then carved subtle holes in the paint to reveal glimpses of the moving cotton. Photographed as a separate element and then composited with the painting, the cotton technique pro-

duced the sensation of cascading water.

Combining these elements with the live action plate was the task of matte photographer Neil Krepela and assistant Craig Barron. After extensive wedging of each individual element to determine just the right combination of color correction, diffusion, and exposure, they composited the painting, rolling cotton, and the projected live-action plate by multiple passes on the same camera negative.

The Genesis explosion and formation of a new planet was a major challenge of the project that I left until the last few months of the schedule. At this point the live action and computer graphics were nearly completed, but dozens of motion control blue-screen elements were yet to be shot. Although I had an animated artwork technique ready to use as a backup, I really wanted to get the incredible detail and dynamic color changes that are characteristic of explosions photographed at high speed. I asked ILM pyro expert Thaine Morris if he could find an explosive mixture that would eliminate the sparks and billowing smoke that seemed to accompany all the stock footage explosions we looked at. He thought it was possible, but only by making the explosions faster. In order to slow them down to get the cosmic scale needed for the scene, we would have to shoot at a very high frame rate.

To iron out these problems, we rented the Oakland Auditorium for a few days to shoot tests in 16mm. Camera operator Stewart Barbee aimed at Actionmaster high-speed camera toward a 40-foot square black background suspended from the ceiling. Test explosions were set off just below the black square and directly over the lens to produce a "zero-gravity" look. The camera had a maximum speed of 500 fps, but by running the dailies on an analyst projector, we could simulate what various charges would look like at 1,000, 1,500, . . . even 2,500 fps. By the end of the week, Thaine had the combination of multiple charges, when fired in the right order, that would produce colorful starbursts with no sparks and a minimum amount of smoke.

In addition, we discovered that a single flashpowder charge would leave a large, well-formed smoke ring that would slowly expand outward against the black square. If we waited for the ring to form, then set off the main charges, the ring would be il-

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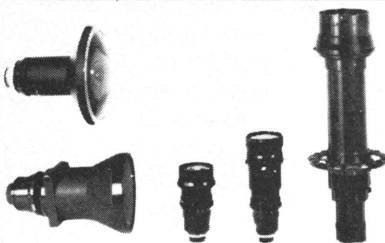
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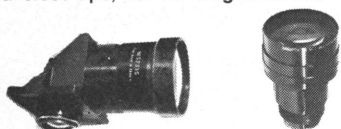
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luminated with a soft blue color. The high-speed camera froze its position in space, while the main starburst sent rays shooting through it. This established the look for Frank Ordaz's multiple-ring painting at the end of the explosion sequence. Another happy result of the Oakland tests was a sophisticated version of a firework pinwheel Thaine developed for the spiraling debris that forms the new Genesis planet. The pinwheel was spun at very high speed, spewing out thousands of sparks in a spiral pattern. Then a succession of charges suspended below it were set off in rapid sequence. When footage from the Actionmaster camera was projected in reverse, it showed thousands of particles and some big glowing chunks spiraling slowly inward toward the hot pinwheel mechanism. We estimated that a camera speed of 2,500 fps would be needed to shoot the effect in 35mm.

One thing we learned from the tests was that we needed to get the pyro further from the camera to increase its scale. The largest space we could find locally was the Cow Palace in San Francisco, so Rose Duignan managed to get 4 days of shooting time there with the place emptied out and stripped down to the concrete floor. Supervising stage technician Ted Moenke and his crew set up the black square grid, suspending it from the 110-foot high ceiling on motorized winches. A cable on a pulley was dropped through the center of the square to suspend explosions directly over the camera position. The late Bruce Hill brought in his two Photosonics 35mm high speed cameras, and the crew mounted them on a rigid steel pipe rig. One camera had a pin-registered intermittent movement that could achieve 375 fps. It was used to photograph the closest view of the Genesis explosion, where the distant *Reliant* becomes a tiny fireball that grows into a gaseous cloud, and rays shoot out toward the edge of the frame.

To photograph a further view of the explosion, with rays shooting out through a blue gaseous ring, Bruce used his Photosonics prism camera at 1,500 fps. This was the most difficult shot to obtain, probably because we were trying to make somewhat unpredictable explosive materials create a very specific pattern and sequence in 1/10 of a second real time. The spiraling debris effect was the most complicated for Thaine to

set up, but it only required a few takes. At 2,500 fps for this shot, each take on the prism camera consumed a full 1,000 foot magazine. The entire shoot at the Cow Palace consumed 35,000 feet of Fuji 250 negative. Effects Editor Peter Amundson, who assembled footage for all of my shots in the film and prepared them for optical compositing, was able to organize the dailies on location so that we could analyze the results of various powder mixtures on the spot.

Explosions shot with the prism camera were far too unsteady to combine with other elements, and the reference lights we had tried to place in the corners of the frame did not come out well. Pat O'Neil from Look-out Mountain Films managed to solve this problem by repositioning the negative frame by frame in his optical printer. After trying several different methods, without success, he ended up tracking a single spark from the explosion, assuming that it was moving at a constant speed. This produced a slow drift of the image on the resulting interpositive, but the picture was remarkably steady. Later, when ILM's Dave Berry composited the shot on a 4-perf printer, he introduced a slow, steady move in the opposite direction to cancel the drift from Pat O'Neil's printer.

All the miniatures for the space scenes were shot at ILM using traditional motion control photography against a back-lit blue screen. While tedious and time-consuming, the blue screen procedures practiced at ILM are extremely reliable. Although it may take months to see a final composite, the results are fairly predictable, and major changes can be made by manipulating individual elements in the optical printer.

The success of this and other techniques used for the film relied heavily on the skills of optical photography supervisor Bruce Nicholson and his staff. The optical department ultimately has to solve whatever technical problems remain in a shot as the elements come together, and it has to meet a nearly impossible schedule while pleasing the aesthetic demands of the producer and people who may have worked on the shot. Laboring on three major effects films at once, Bruce and his staff consistently produced high-quality composites, usually in just a few takes and always on time. From a special effects standpoint, the success of *STAR TREK II* was largely due to their efforts. ■

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Brick by Brick

Continued from page 1021

begin preparing production on THE WALL with Production Designer Brian Morris, who I had worked with many times before. Garth had nursed both ALIEN and QUEST FOR FIRE through and was perfect for the task. Brian had recently done QUEST FOR FIRE, YANKS and TIME BANDITS, and it was a good opportunity to work with him again. In the middle of filming SHOOT THE MOON, the Pink Floyd were performing, supposedly for the last time, the Wall concerts in Dortmund, West Germany. I'd never seen it, so Michael Seresin and I flew on the weekend of Washington's birthday from San Francisco to Germany and back. It was impossible not to be impressed by the power of the proceedings. The concert was Rock Theatre on the grandest scale. Probably more grandiose and ambitious than it had ever been. The sound was awesome, the Floyd musically precise and Roger's primal scream, the fears of madness, oppression and alienation cutting through the giant theatricals. You couldn't fail to be astonished by the sheer scale of the mechanical undertaking and the colossal engineering problems that had been overcome to present it.

Coming from the slow, almost archaic film process, to see everything—every sound fader pushed correctly, every hoist, every light, every cue hit on time, was wonderfully impressive. The high points for me were the guitar solo in "Comfortably Numb" that Dave Gilmour performed precariously perched on top of the wall, back lit, his weird surreal

three dimensional shadow bleeding across the faces of the 10,000 plus audience. Also I had a chance to see Gerry Scarfe's animation for the first time. The flowers making love I thought were brilliant, and when the marching hammers of oppression burst across the mammoth screen formed by the wall, in triptych, with three projectors synchronised together with the live show sound, it was a theatrical sensation I knew

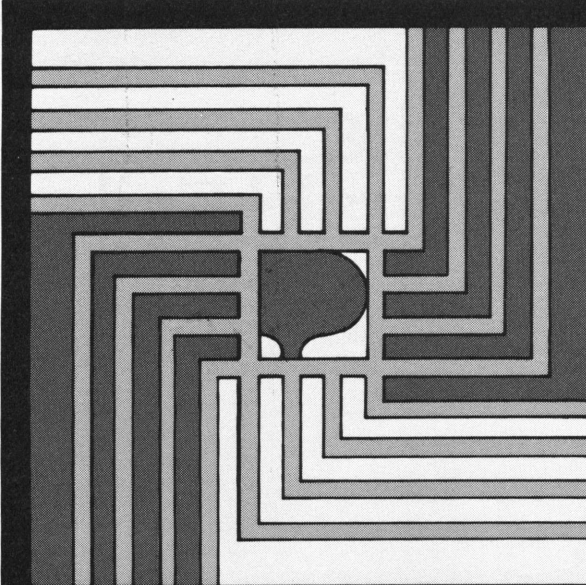
The concert was Rock Theatre on the grandest scale. Probably more grandiose and ambitious than it had ever been.

would be difficult to contain within the confines of a regular screen. Anamorphic Panavision and Dolby sound suddenly looked pathetic by comparison. Backstage it was just as impressive—no cliché rock and roll parties, but an ultra cool and professional atmosphere, not entirely relaxed, a little edgy in fact, but people with a job to do, that happened to do with being rock and roll stars. Also of note was how everything was dominated by Roger's almost demonic control of the proceedings.

Back in San Francisco, I wondered if it would ever work. Roger and I obviously had been in control of our own destinies for far too long to be able to kowtow to each other . . . but I was visited by Steve O'Rourke, Pink Floyd's manager, who was to serve as Executive Producer and put the

deals together. He offered unbounded enthusiasm and was to be the Alexander Haig between Roger and myself in the year to come, as he shuttled between us with the thankless task of trying to keep the peace for the sake of the film. Once SHOOT THE MOON was finished, I returned to London to complete the editing. It had gone well and was a relatively uncomplicated film, cutting together quite smoothly. This meant I could spend a little more time on THE WALL, the next stage of which was to work a little more seriously on Roger's script.

Roger, Gerry and I worked in Gerald's studio in Chelsea and once again we battered away at the script. I would play the straight man to Roger as I endeavoured to push it away from the theatrical spectacle to make it more cinematic, and he would articulate at great length in order to ram home the deeper meaning of each fleeting note and syllable. For Roger it was never a case of writing a script, it was about delving into his psyche to find personal truths where I was more interested in cinematic fiction, indeed if I veered too far away, he would say "But that's not how it happened." Gerry would quietly and unemotionally preside over these stormy "special brew" days between Roger and myself, and when we left, would draw up the day's thoughts into a wonderful, giant storyboard that grew larger and larger, gradually spreading across the walls of his studio. The difficult process was to abandon the more effective theatrical devices of the show for a more cinematic approach. But always the



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music was the beginning of everything we did, although as the script evolved, certain songs had to be re-juggled into an order more helpful to the clarity of the narrative.

At this stage in its development, the script still retained much of the show. One of the original intentions was to sprinkle Pink Floyd through the piece in a straight but theatrical situation, to act as narrators wherever our imagery had begun to flag. To this end it was decided to put on five more concerts in England, where band and crew could be filmed. At this time, Steve O'Rourke and I went back to Los Angeles to show the new storyboard and draft screenplay to the major Hollywood Studios to try and raise the money. It was a new experience for me and a rather depressing time. Most of the people who had put their arms around me as a director evasively turned their backs on me as a producer. Also, as I would describe the unusual nature of the film to the various moguls—major and minor—a fusion of different film techniques, a fragmented piece with no conventional dialogue to progress the narrative, with music as its main driving force, they would stare back at me with total incredulity. No one could perceive that we were making something other than a concert movie, a genre which had traditionally often yielded them limp returns at the box office. The enormous success of the record 11.7 million double albums sold was our only trump card, and they greedily eyed a part of the soundtrack album which Pink Floyd of course had no intention of giving away. Steve and I kept up our spirits as we waited for the phone to ring at the Beverly Wilshire. But, one by one, the "dead-certs" turned into "maybe's" and finally "no's." David Begelman at MGM was the only one to take a chance on us. I'd made FAME and SHOOT THE MOON with him, and shook his hand on a deal. I'm sure he was as puzzled as the rest of them as to quite what we would do, but he did invest a certain amount of trust, and I would have to honour it.

Back in England, the concerts were performed at Earls Court in June, and we set about, over five nights, with three camera crews to obtain the necessary footage that would supposedly be used in the story. The filming was a total disaster. Michael and Gerry didn't quite gel as directors and myself, quite useless as an im-

potent director masquerading as a not-too-helpful producer, began chain-smoking for the first time in my life. From the start, the dilemma was always compromising the theatrics of the show for the needs of the film. The show, better organised, and ticking along like a precision made behemoth, couldn't be spoiled by the film crews, not ever sure of what they were supposed to be doing. The fast Panavision lenses, needed for the low light levels, had no resolution, so the rushes looked like they'd been shot through soup. A Louma crane shot that scaled the wall to reveal the thousands in the crowd as Roger sang "Hey You," never got its complicated moves right—and with five live shows it only had five chances—all muffed. It was a nightmare. For myself, I'd shaken David Begelman's hand, and was beginning to think I might let him down. As I nervously walked back and forth during the show, watching the performance from a dozen different vantage points, inhaling the contents of three packs of cigarettes or sitting alone backstage in the peculiar astra-turfed Floyd inner sanctum, it was obvious that it couldn't go on like this. Either we abandoned the film or I had to come out of the producer's closet and start directing proper. The Floyd, who were footing the bills themselves at this point, had come to the same conclusions.

It was obvious we couldn't go on like this. Either we abandoned the film or I had to come out of the producer's closet and start directing.

There were a number of obstacles to me taking over. Firstly, Michael Seresin, a good friend who'd worked with me on most of our work for the last 15 years, would obviously be put out by me directing. Understandably, he wasn't happy just being director of photography and, sad for me, he stepped down. Gerry Scarfe had his animation to get on with and agreed more easily. For myself, it was a case of being back at square one. Roger was a formidable challenge for anyone used to getting their own way, as I am. As we'd seen with Gerry and Michael, his personality and grasp of the material were intimidating for anyone who dared take it away from

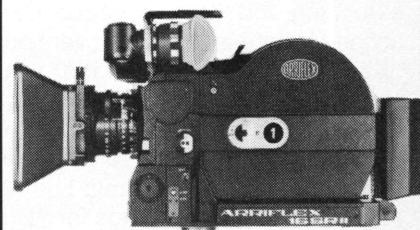
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him—but even so he was keen for me to direct. We were both obdurate to a fault, two opinionated egotists used to running the show. Did I want the aggravation? Most of the people close to me, oddly enough, said I should. I had undoubtedly a passion for the possibilities of the film, but although I paid lip service to the romantic notion of a collaboration of different artists, deep down I was a little fearful of not getting my own way. My two main provisos to Roger for taking over were firstly that he stepped back a bit to give me air so that I could clarify my own vision of the piece, and secondly for my usual producer Alan Marshall to take over the producer's role Roger and I were only half accomplishing. Conveniently, this six weeks prior to filming coincided with Roger's summer holidays, so I got my desired breath of air.

Personally, this was the most valuable time for me, when I took the blueprint of our script (just 39 pages) and began to formulate in my mind the images that would accompany the music to tell our story. Meanwhile, Gerry Scarfe, who had some months previously begun his new animation, extending the flowers sequence to accommodate an extended version of "Empty Spaces," a piece that would show the building of illusory walls of post war consumerism, as well as "Blue Sky," which was to be a piece on the waste of war. Gerald had also done a number of drawings for "Brick in the Wall II," a maze and a human mincer to show the factory farm techniques of a repressive and blinkered educational system. Brian Morris set about translating these small drawings into mammoth sets. A lot of time had been wasted earlier in translating some of the more spectacular live show aspects into film. A giant electronically controlled teacher puppet had cost a lot of money and man hours to develop, but never looked like being in our film as it took on a cinematic life of its own. Indeed hardly any of the theatrical devices survived as the reality and surreality of our film took over.

The concert fiasco had provided us with an unexpected bonus in that it proved the narrator idea to be superfluous and convinced us that any use of live rock and roll band would only cheapen our endeavours to make it anything but a concert movie. My priority at this time was to cast the film. 'Pink,' our main character, had to be found and I first trod the well worn

route of British actors. Although there were many I could have cast who had the necessary acting talent, none seemed to have the special charisma of a rock star. I then went to New York and made a short list of American actors who could cope with the role—and add a little more danger than their British counterparts. I also thought we should examine the possibilities of other rock artists. True, we had all agreed that Roger shouldn't play the part—it inhibited the development of ideas involving the main character and anyway, Roger was not necessarily equipped to cope with the dramatic side of things.

Bob Geldof came to mind because I'd liked his performance since seeing a video he and the Boomtown Rats had done for his song "I Don't Like Mondays," and his theatrical qualities had stuck in mind. I met with him and, not being a Pink Floyd fan, he wasn't sure if he wanted to be involved. But there was a lull in the Boomtown Rats' schedule and the idea of "posing on cue," as he put it, appealed to him. I had to be sure that he could

Peter Biziou lit this interior with one enormous brute light at floor level, minus its glass front fresnel.

cope with everything, so I did a screen test where we improvised for a short while, and then a more controlled scene where Bob delivered the courtroom scene pages I'd sent him from MIDNIGHT EXPRESS. He did it wonderfully and surprised us all with his control, although it was kind of strange to hear it done in 'Dunleary' after getting used to Brad Davis' 'New Jersey' version. What was clear was he was capable of those moments of unexpected magic that you can never legislate but always hope for. His biggest fear was the swimming pool scenes, and he spent two weeks at Clapham Baths perfecting a passable dog paddle. To find the Young Pink (aged 11) and Little Pink (aged 6), I organised an open call on various local radio stations in London, Manchester, Leeds, and Glasgow to cast as wide a net as possible. A couple of thousand kids and many hours of video tapes later we narrowed it down to the Geldof look-alikes, Keven McKeon and David Bingham, both of whom had never acted before. In fact, Kevin only

turned up at the session in Leeds as he'd been asked to take along a young neighbour's child to the casting. For the rest of the cast in the main I used people who had worked with me before. I was particularly happy to get Bob Hoskins to play the manager. For the hotel room scene I wrote dialogue for Bob to work with, but he soon abandoned it and improvised on his own, giving the crew a few laughs they'd been denied with the rest of the filming.

My crew for the shoot were to be the people I'd worked with over a long period of time. It takes a while to develop a rapport with a crew and I had mostly my crew from MIDNIGHT EXPRESS: John Stanier (camera operator), Ray Corbett (first assistant director), Clive Winter (sound) and, most importantly, Peter Biziou as cinematographer. He had done a lot of my early work, including part of BUGSY MALONE and had recently done TIME BANDITS and LIFE OF BRIAN, as well as my long time editor, Gerry Hambling, who was to magically transform our rushes into the end result in the months that followed.

On Monday, September 7th, we began filming at a retired admiral's home in East Molesey, which served as Young Pink's house. The former occupant had, fortunately, not decorated for many years and the task for Brian Morris to restore the period interior was not too difficult. We also shot a sequence with teacher (Alex McAvoy), and his wife (Marjorie Mason, another regular—Mrs. Graham in THE EVACUEES). I had been goading everyone to be brave on this film, depart from our accustomed practices, consequently, Peter Biziou lit this interior with one enormous 'brute' light at floor level, minus its glass front fresnel. The harsh light effect looked great, and you could see the pores on their faces. As we filmed the interiors, outside the second unit had the thankless task of working with six cats, and three crates of doves, in a vain attempt to capture a shot of a dove soaring into flight. It was a very important transition into Gerry's "Blue Sky" animation, as the dove explodes into the Germanic Eagle of War. A week of perseverance, 50 doves and 20 lost pigeons later, we managed to get a few fuzzy frames of usable fluttering wings.

A playground in Bermondsey was painted a dirty 1940's green, dressed with period swings and slides and a

lorry load of brown leaves blown across by wind machines to give us the yellow colours of autumn that memories always seemed to be made of. The surrogate father that Little Pink tries unsuccessfully to attach himself to was played by Ray Mort, an old regular of mine who had played the father in *THE EVACUEES*. Fresh with images from Gance's *NAPOLEON*, I got John Stanier to come down the slide, Panaflex camera on his shoulder. Unfortunately, he looked a lot more spectacular doing it than the resultant shot, which we didn't use.

The recurring dream of Pink's childhood as he interminably runs across the rugby field, we filmed on Epsom Downs. I'd seen a dozen different fields but none ever gave us the eery dream quality that we were after. Eventually I decided to erect our own posts on a perfect spot on Epsom Downs, with the sun peeping over the hill back lighting Young Pink as he ran towards us. The light was just right only from 5:30 to 6:30 a.m., which meant we had to go back a couple of times to get it just right. Also, our 'rat man' who arrived each day with the tame rats in a case, was never quite sure which ones were tame and

which were not. We lost a lot of rats.

The exterior of the Los Angeles arena was done at Wembley. We'd recruited as many kids as we could from the local American School and Brian Morris provided the necessary U.S. paraphernalia, hot dog stands, cops' cars, and Harley Davidsons for us to complete the illusion. Apart from our stunt coordinator who wanted to fit more stunts than *Spartacus* into this short section, it went off without a hitch.

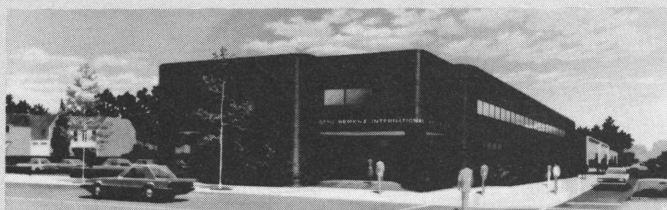
Our rat man who arrived each day with the tame rats in a case was never quite sure which ones were tame and which were not.

The Anzio sequences had been honed down to a practical size by the time we dug in and transformed Burnham Beaches at Barnstaple into the Anzio bridgehead, complete with miniature barrage balloons, bunkers, and Italian gun emplacements. We'd given up looking for (or indeed building) our Tiger tanks, and instead made do with a number of historic vehicle so-

cieties, and barrage balloons, which Brian Morris performed miracles with, creating a battlescape that filled the anamorphic Panavision frame for as far as the eye could see. Our 200 soldiers were enlisted from the local labour exchange and performed like regular troops for the battle scenes in "In the Flesh I" and the aftermath of battle that begins "Thin Ice." Our request for limbless soldiers was answered by two local gentlemen who turned up each day, changed into battle dress and were dug into sand. Our only complaints were when I had built a deep muddy trench and piled in a hundred 'dead' soldiers—a scene I wanted to add to 'Nobody Home.' The moans came when we put in live rats. An additional fee was quickly negotiated by a self appointed shop steward. The special effects men probably had the best time of all in their efforts to please. More and more petrol being called for as the explosions got more and more ambitious. I kept asking for more smoke and eventually we mobilized a machine that had seen service with the Royal Navy creating smoke screens for destroyers. As usual on location in England, it was a constant battle between rain showers and harsh unfilmable sun-

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light. A storm on the second night blew away the costume tent and Penny Rose, our costume designer, screamed into the bar for help and soon the crew were plucking the uniforms from the beaches. It was like a scene from "Far From the Madding Crowd" as they try to save the hayricks.

Bob Geldof had his first taste of filming sitting in a chair in the alien landscape choking on our smoke machines and doing a great deal more shivering than acting. On another beach, Garth Thomas, a flying fanatic, was taking charge of the two model German Stukas—the first of which nose dived into the sand before we could even turn the cameras. The second had a brief lease on life that gave us our desired shot before it too disintegrated in mid air and we returned to London. Another part of the beach had been made into the "Alien Landscape" for "Nobody Home." We were very fortunate with the light as it shone through the clouds, casting eerily onto the petrified trees and charred hammers of Pink's hallucination.

At the same time up at a laboratory in Oxford, a number of boffins had been trying to work out how to film a

shot I'd devised at the beginning of the film, starting tight on Pink's Mickey Mouse watch and tracking across the hand, very close, the skin like the scales of a chicken, across the mountainous ash of a burned out cigarette and then slowly moving in on Bob's eye, culminating with a blink to help us through the cut. The gentlemen at Oxford are mainly research biologists and their techniques were perfected peeping at the sex life of insects. They had already shot for us the slow motion globule of blood we used in 'Don't Leave Me Now.' At one time I had thought of using the sexual morés and violence in the insect world as metaphors in our story but it was soon abandoned—anyway, the rate these diligent scientists work, we would still be finishing the film. The wriggling worms we used later were shot in a corner of the set at Pinewood. For the opening shot on Bob, Oxford Scientific had been experimenting for weeks with a curious periscope lens on the end of an enormous counterbalanced arm, the focus and tilt electronically controlled but the main operating done by our operator David Garfath. He looked most peculiar as he bore down on Bob's eye with his periscope lens, more like a

German U-Boat captain than a camera operator.

At Pinewood it was time to shoot the interiors of Pink's hotel room. On the large 'D' stage we had built an enormous composite set, complete with a Los Angeles back drop, a thousand distant twinkling lights—all computerised—and a penthouse swimming pool holding 70 tons of water. The scenes here were to be the fulcrum of our story as Pink, locked in his room, drifted slowly into his memory and ultimately into his madness.

As far as our filming techniques go, I don't think we tried *anything* we hadn't tried before, but we certainly used *everything* we'd done before. We used the Samcine inclining prism on the lens of the Panaflex camera to allow us to film from floor level to help our distorted view of Pink as he gradually slipped into his own distorted view of the world. I borrowed again from Abel Gance and suspended the camera on a pendulum to film Pink thrashing around in his own imaginary pool of blood as he recalls his father's death. The image of the red pool was a happy accident, as we overdid the blood on Pink's cut hand scene. It was bizarre to see your accepted notion of a blue pool suddenly turned

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a vivid red, and so we took advantage of it as we tipped in our remaining buckets of Kensington Gore. Pink floated in this scarlet syrup, the camera slowly zooming out to its position, suspended upside down in the studio rafters.

The groupie was played by Jennie Wright, who I had cast in New York. The scene where she comes back to the hotel room after the concert was one of our very few conventional dialogue scenes in the film. A little island of normality amongst the music. The kissing of the fingers was a spur of the moment suggestion to inject a needed amount of tenderness. At first it was difficult to get the delivery and intonations from the album out of our heads. It had worked so well on the record because it was slightly over the top—but here, in the flesh, the performance had to be toned down to a more subtle reality. Destroying the hotel room took no time at all. Bob launched himself, as usual, into each take with equal ferocity. He was cutting his hands quite badly each time and fortunately there was little left to break when we had to stop. John Stanier, my camera operator, is wonderful with the hand held camera and many of the high energy scenes in our

previous work (for example, the tongue biting scenes in MIDNIGHT EXPRESS, or the "hot lunch" jam in FAME) were captured due to John's ballet dancer's feet and brick layer's shoulders! I once called him my dolly with legs.

The acoustic guitar piece at the end of "Is There Anybody Out There" was to be the manic work of art that Pink had made with the assorted trivia and debris of his room. It took a

I borrowed again from Abel Gance and suspended the camera on a pendulum.

good couple of hours as Brian Morris and Chris Burke, art director, laid out their artwork; a sort of deranged Rauschenberg. Shaving the eyebrows at the end of this sequence was very unpleasant. As often happens with these kind of special effects, although everyone on the crew knows that we're watching an illusion—it's not real blood and it isn't real flesh being nicked—it's still impossible to watch. As it transpired, it was also impossible to watch the rushes, and eventually we played the scene by allusion as we concentrated

on the drips of blood into the murky suds. A lot of people watching this scene often think the blood portends injuries of a more serious nature.

For "Comfortably Numb," Bob Hoskins, playing Pink's manager, gave us all some welcome light relief. His ad libbed lines as the paramedics tried to revive Pink, succeeded in making the crew laugh as well as Bob Geldof, who was interrupted out of his catatonic state by Bob's one liners. The metamorphosis of Pink into his pink effigy—his vulnerable self—was the end of shooting on the hotel complex. We'd also filmed the corridor scenes that accompany the Vera Lynn song that opens our film. This set was built in Pinewood's long special effects tunnel to give us the length we needed. Once again we used the prism on the camera to give us a lower than normal shot as the dolly crept along the carpet.

Shooting the scenes of Pink's wife and her lover were a little more nerve racking. For pragmatic reasons, we left the studio and had re-dressed the downstairs floor of a Kensington house. Love scenes are always difficult to pull off. Your first job as a director is to relax the actors who, in this case, were more relaxed than I

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was. The morning's filming was spent with Bob and Eleanor David (wife) filming the short scenes that were to show the gulf opening up between husband and wife, the loss of affection and the slow withdrawal of Pink from their relationship. James Hazeldine, who was playing the lover, arrived early, and I sent him across to the pub for a stiffener to relax him for the lovemaking scenes I hoped to start immediately after lunch. By four o'clock, when we did start, he was far from relaxed. He said he felt great at two o'clock, but now he had a hang-over! I cleared the set for the more intimate scenes. Only the operator and focus puller would be necessary. I moved the sound speakers close to the bed and played the playback tape extremely loudly—partly to motivate the actors but probably more to disguise all of our embarrassment. As the three of us encircled Eleanor and James, paid voyeurs with a Panaflex camera, and even more bizarre, forty crew crowded in the room next door listening to the grunts and groans.

Back at Pinewood, the giant wall was ready. Made with granite-like blocks, it had a false perspective and nonfinite edges to give the impression of it going on forever. This was to

cover sequences in "Goodbye Cruel World," "Is There Anybody Out There," and "Hey You." Originally, we had planned a sequence where the wall opened up, as in the live show, but these scenes gave away their theatrical parentage and were soon discarded. The tearing down of the wall was done with very little actual explosives, but with an enormous air cannon which we'd borrowed from James Bond. We covered the explosion with five cameras plus a TV camera, the monitor of which was placed at a safe distance outside the stage where we had all huddled.

Then on to what we feared would be our most difficult shoot, "In the Flesh II." In the early days, we had experimented with false perspectives to try to recreate our own giant Nuremberg, but as we worked on it further, the idea seemed to diminish as Brian Morris' set models became bigger and more and more elaborate. Eventually, we settled for the reality of the Horticultural Hall, with a specially built stage, lighting towers and a hundred flags bearing Gerry Scarfe's crossed hammer symbol. Always in the back of my mind was whether we would out-do the spectacle of the live show—the theatrics of which this

scene closely resembled—ours would be styled a little differently of course, with a slightly more realistic, grittier edge to it. But we'd be hard pressed to match the sheer size of the concert. The call sheet for October 28th, the 38th day of filming, reads: special requirements, 380 skinhead audience; 24 choir; 21 brass band; six mothers with babies; 30 guards; smoke; playback; stunts to include escape scene and three guard dogs.

Curiously, considering the complexity of filming in a massive area, through 360 degrees, with a difficult crowd, this went very easily. The skinheads were our biggest problem. Making them behave in a civilised manner, keeping them from getting bored, and reminding them about the difference between reality and filmed illusion, wasn't easy. I had a fortunate ally in Ray Corbett, my assistant director, who is a frustrated regimental sergeant major, and relishes barking orders to noisy crowds of extras, and indeed lost his voice shouting in the next couple of days. The toughest section of the skinhead crowd were a group called the 'Tilbury Skins' from Southeast London. We'd partially diffused the threat of real violence by

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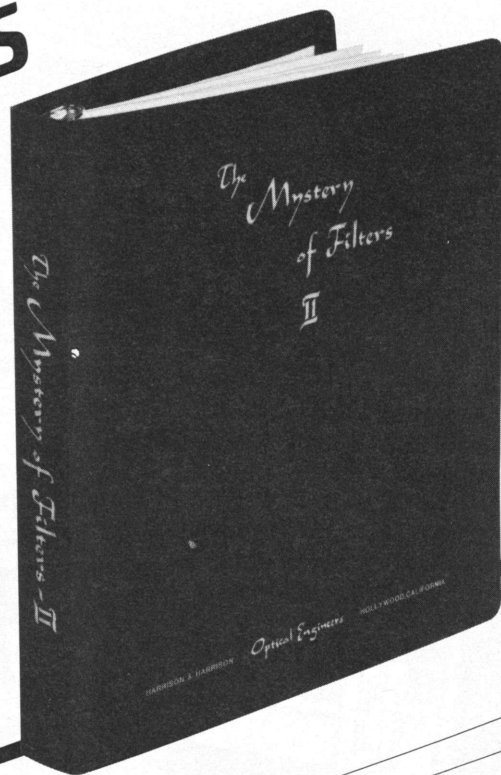
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elevating this group to a more prestigious position in the film. They were to play Pink's "hammer guard," and we were going to use this bunch of amiable loonys as the kernel of the recreated violence that was to follow. Our stunt coordinator had been working with them for a month previously at Pinewood, showing them the rudiments of film stunting, the ability to punch someone without the need for breaking their jaw, and we'd arrived at a sort of disciplined logic to their behaviour. Well, sort of. I remember the crowd reactions as Bob first made his entry for "In the Flesh II," and then proceeded to sing the odious lyrics—the sheer spectacle of the proceedings was very seductive and I can remember my fears of people taking it too seriously—and the niggling feeling always that we should make it quite clear to the film audience that what they were watching was great evil; the exercise of power by an inflated, demented persona over a mindless audience. When you're making a film, it's pieced together like a giant lego set, shot by shot, decision by decision, a thousand decisions a day—and then you eventually see the cumulative effect the total has on an audience. Then you realise the awesome responsibility of those small decisions. The most alarming feeling was in the pub at lunchtime, when our jackbooted guards in full uniform walked in and ordered their pints. The local residents, unaware that it was a film, weren't sure what to make of it. For them the reality of this impending evil was too close to home. The filming went like clockwork. Peter Biziou's lights poking through the glass roof made shooting quite effortless for the three cameras we used, although at one moment, a light in the roof burst through the glass ceiling, showering glass on the crowd below. Fortunately, no one was hurt.

Next came "Run Like Hell." Our choreographer, Gillian Gregory, who had worked with us on 'Bugsy,' had devised a Nazi-like disco routine. She had spent the morning rehearsing the crowd in batches of a hundred in the hall opposite, and had whipped them into passable shape. I remember my feelings as the assembled skinheads dutifully performed their fascist 'dance' for the first time to the playback tapes, complete with choreographed sieg heils, donning their pink masks and so wiping out their personalities and taking away their individuality as they became anonymous,

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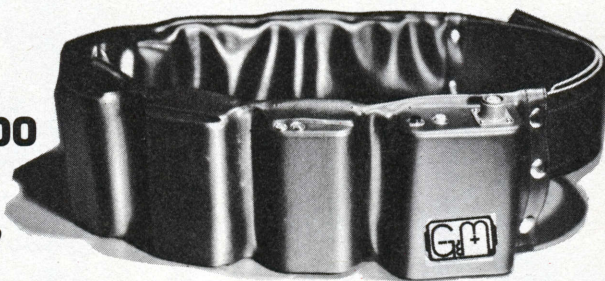
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acting as one in an unthinking, programmed, mechanical mass. At the end of the piece, on stage, Bob goaded them into action with his crossed arms hammer salute. This they followed with a zombie like precision, perfected on the terraces of West Ham and Milwall.

Day 41 found us at Watford Football Ground for scenes of football crowd violence—only a snippet of which now appears in "Waiting For the Worms." I'd wanted to create a stabbing which had been gruesomely documented in the newspapers after a European match, where the British fans had rioted. Recreating, in a real-

istic manner, familiar scenes like football crowds are the most difficult of all because they *are* familiar and any phony film imperfections really show. We had rehearsed a pretty nasty incident involving crowd fights and culminating in a bloody stabbing, but the result on film was never very satisfactory. Often precise, choreographed shots don't sit too comfortably with the realistic violence that we have become accustomed to witness via the ad hoc newsreel camera.

The suburban street rally that is the basis of "Waiting For the Worms" (as the mindless hysteria of "Flesh II" and violence of "Run Like Hell" pours

into the everyday reality of suburban streets) was shot in a quiet backwater of Muswell Hill, behind the burned out shell of Alexandra Palace. The very presence of this evil in such an environment was somehow more evil because of its very "ordinariness."

The "Institution" scenes were an area where Roger and I had differing views. In an earlier draft script he had alluded to a bald-headed loony munching sweets in a padded cell. This fear of impending madness, probably Roger's fear of becoming like Sid Barrett, were images that interested me and I wanted to develop. Roger probably wished he'd never mentioned a bald-headed loony. At a disused cake factory in Hammersmith, we had converted a dilapidated, damp walled warehouse into a surreal lunatic asylum ward. The image of Bob being wheeled into this weird room with its rows of neatly made beds, without occupants, was an image I very much liked, but in the end we settled for a glimpse in "Hey You" and a section I'd shot to continue Young Pink's wandering in the "Alien Landscape" and into the bunker that leads us into the lunatic asylum ward and cell and finally face to face with his demented adult self.

The cake factory also figured in the conclusion of Pink's metamorphosis begun in the studio hotel composite on "Comfortably Numb." The application of the vicious pink make-up was dreadfully uncomfortable for Bob and he complained, quite rightly, for the first time in the film. Up to now, he had gamely thrown himself into everything I'd asked of him, but for a moment he'd had enough. As he was dragged down the iron fire escape in the bitterly cold air, clothed only in the remnants of his suit and a heavy dolloping of pink gunk, he was heard to shout in angry Dunleary: "He's gone too far, I will not be physically abused."

The steam train sequence in Young Pink's childhood proved more difficult. We had examined railway lines as far off as Liverpool and plumped for the Keighley and Worth Valley Railway near Bradford, where the authentic 1940's steam trains were still in use. Originally, the tunnel had been chosen to accommodate the giant teacher marionette which then figured in the scene. But as it dangled from its crane arm (an electronic marvel waving its cane), it was clear that it was one of the last elements of the stage show that just didn't work in the harsh realities of this Bradford

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tunnel. The main tunnel scene and railway embankment with Young Pink and his friends was shot along the line, our only access being to load up the cattle trucks with crew and equipment, and shuttle to the location, in the middle of the Yorkshire moors. It was a very eerie sensation as the doors were slammed shut behind us.

"Bring the Boys Back Home" was shot at Keighley Station, the extras being ordinary local people pepped up with the local amateur operatic society, and a few over-the-top pantomime principal 'boys' who were hidden in the crowd whenever possible. It was a hard job keeping everyone in time with the music, but eventually we managed it—just—and the voices were beefed up later in post production.

Back at Pinewood, Brian Morris had finished our biggest set; the school maze and human mincer complex for 'Brick II.' We had drilled the kids into regimented automatons, the pink masks once again wiping out their personalities as they are processed through the mechanical production line techniques of a blinkered educational system. This was the best known piece of music and indeed the piece most people readily identify with THE WALL. For this reason we wanted to make sure we did it justice. The destruction that accompanies the guitar solo began in the studio where the sets were demolished for real, by our eager young actors, and continued at Becton Gas Works, where a derelict Victorian gas board building was carefully set on fire by the Special FX department, eyed nervously by the local fire brigade, who were not as convinced as we were about the control we had over the conflagration. The result is one of the scarier moments in the film, and one which we hope people won't misinterpret. We were keen that the whole passage should be viewed as a murky surreal daydream in Young Pink's mind, as he is bullied by the teacher for writing 'poetry.' "Absolute rubbish, laddie," says the teacher, as he reads out the childish rhyme. (Actually, the lyric of the Pink Floyd hit "Money.")

We were now into our final week of filming. For "Stop," where Pink screams out loud to halt the nightmare of the marching hammers, we had returned to a set we'd built at Pinewood Studios of the arena lavatories. We were faced with choreographing a shot that slowly circumvents the room, picking up the

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guard washing his hands. With his movement across to the towel, I hoped to disguise the jib-up of the camera as it climbed over the stalls, finally picking out Pink and then slowly moving in on him as he mouths the remaining lyrics scribbled out in his 'little black book.'

For many months, we'd written in the script a phrase which read "we cut to the broader issues," which was a rather nebulous description of the resultant walls and barriers that are erected in society when we become, as individuals, alienated from one another. Consequently, on day 57, the call sheet read; exterior, broader issues: 150 rioters and police; stunts; police riot equipment; two police vans; police cars; FX fire, smoke and explosions; tear gas guns. Quite what I was going to do with this ensemble, I didn't know until the night. At Becton, the disused gasworks was an inhospitable place to work in, and there was a slight contretemps with the crew who were demanding "dirty money" for working in the rain, ankle deep in years of coal dust. The riot footage was an improvised affair that developed through the night. The only images I'd pre-conceived was the "wall" of riot police, their shields glinting in the light, behind them a second wall of flames. As the night drew on and the skinheads and 'police' clashed for the dozenth time, tempers were rising. The skinheads had found it difficult to grasp that these were actors *dressed* as policemen and that we were creating a *film* riot, not a real one. But, however many times we reminded them, the fighting always seemed to continue long after I had yelled cut.

The violent scenes in "Run Like Hell" were probably the ugliest I'd ever directed. The Brixton café set was built at the back of Kings Cross railway station. One moment it was a perfectly ordinary café and sixty seconds later it had been completely destroyed by the "Hammer Guard" thugs, the "Tilbury Skins," who couldn't believe their luck. The rape scene was the most repugnant of all, and any amount of jokes didn't detract from the unpleasant vicarious involvement you have as filmmakers. On the final cut we kept the scene down to a minimum, as some of the shots were a little too much for us to take in rushes, let alone an audience in a cinema.

The main shooting was over. There were mopping up shots to be done; a

shot at Heathrow for Pink's departure in "Mother," an exploding TV set to conclude "One of my Turns," and some second unit points of view of Los Angeles from Pink's limousine to be included in "Comfortably Numb." But in the main, principal photography was complete and we had wrapped the main unit shooting.

Now we were into post production. I'd had free reign for sixteen weeks now. That was 977 shots and 4,885 takes, over 350,000 feet of film and 61 consecutive 14 hour work days, and my second film in one year. And, however much you pinch yourself: how lucky you are to be a film director, it never seems like a whole lot of fun at the time. Now Roger had returned to reclaim his baby. For the first time in four months, I was being reminded of the realities of the original romantic notion of the collaborative artists. It had long since been romantic.

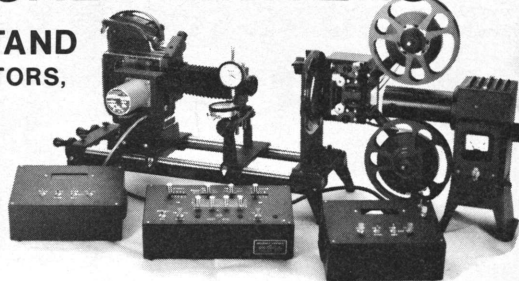
We collided one day in the dubbing theatre, both spouting venom, like the judge in the animation. But in fact, our creative differences were never more than arm wrestling—in the main they were academic—we had similar tastes and were still making the same movie. Frankly, our problems were never really about the film, but about ego and creative authorship. I think he was fearful that I wouldn't let him back in, and I was just as paranoid about the cut being tampered with or improved to death. Fortunately, Gerry Hambling was smarter than both of us, and continued to astound us with his brilliant editing. The most difficult area of contention was "Hey You," and the use of the lunatic asylum (as mentioned earlier), which was eventually trimmed and juggled as an acceptable compromise.

Our editing staff grew ever bigger as tracks were laid and opticals prepared in our vain attempt to meet our dates at Cannes; our first public showing. Meanwhile, in the Pinewood Theatre 2 Dubbing Theatre, James Guthrie (Pink Floyd's engineer) was mixing the music tracks. He was keen not to miss too many generations of sound as is usual in film, but would be mixing directly from the original recorded master tracks. To this end, additional equipment including three 24 track machines, was piled into the dubbing theatre, until it resembled a couple of Boeing 747 cockpits undergoing an overhaul. There was also new music to produce. "The Tigers Broke Free" had never been recorded before and Roger set about complet-

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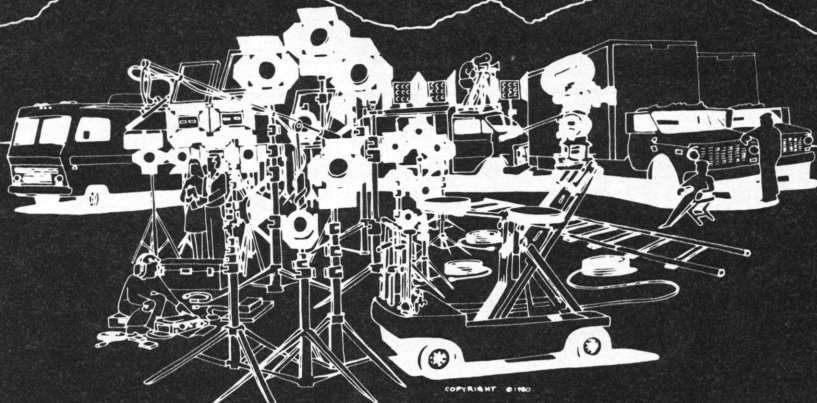


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ing this with Michael Kamen, who had arranged THE WALL album. Also, there was a new version of "Mother" to be done, and "In the Flesh II." "Outside the Wall" was completely redone with silver band, and "Bring the Boys Back Home" with full orchestra and Welsh choir. Also there was a prelude, a quite remarkable piece of music which, unfortunately, didn't quite work with the rather unusual, quiet beginning of the film, and sadly had to be left out.

The animation studio now moved down to Pinewood and a sort of artists' sweatshop was set up in the old gatehouse. Gerry Scarfe and his animator, Mike Stuart, had then to contend with Alan Marshall bullying him into completion. Animation is a laborious and, to me, mystifying, awkward process. They had been well over a year on the 7½ minutes of new animation, and at work on the perfecting of the existing cells—making about 15 minutes of screen time in all. It was a bewildering time for Gerry Scarfe—a little out of his environment really—I kept asking why someone with such a talent as his at his fingertips should want to bother with the rotten cut and thrust of movies, but he continued to turn up.

The dub is always the most rewarding part of a film—when all the elements come together for the first time. Much to everyone's surprise, it was a smooth and civil process and the most amiably cooperative time between Roger and myself. He was very keen to join James and the other mixers on the sound desk and work the sound faders himself. It certainly speeded up the process and allowed him the tactile pleasure of once again being back in touch with his creation. The negative was shipped to Los Angeles for the 70mm blow up to be made and hopefully to meet our first screening at Cannes, with a still wet print flown directly from the MGM laboratory.

After eight months of editing, we had arrived at our final cut. We'd shot 60 hours of film to get just 99 minutes of screen time and Gerry Hambling had made over 5,400 cuts. Gerry Scarfe's animation artists had done over 10,000 full colour paintings to complete their fifteen minutes of screen time. When we began the film, I'd written a letter to the crew where I likened it to Livingstone going up the Zambezi. Now that it was finished, in retrospect, it felt more like going over Victoria Falls in a barrel. ■

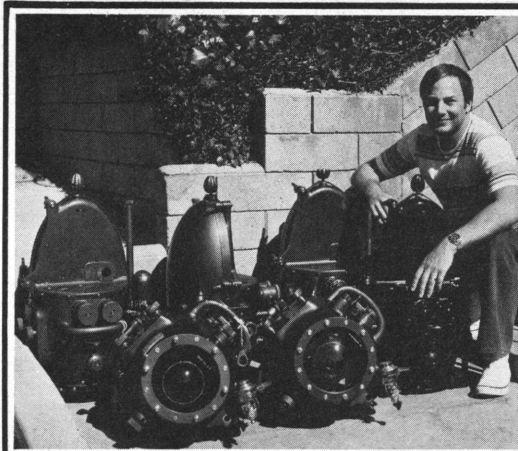
standard lamp. All in the same shot the camera tracked past the cigarette, coming inside the wrist, and approached the face. Eventually, the camera "homed-in" on Bob's blinking eye so close that the shot ended in the blackness of the centre of his eye. Mike, the focus puller on this shoot, had the unenviable task of holding all this sharp on screen from start to finish. All credit to him he finally succeeded and takes 10, 11 and 12 were all winners.

Other shots contemplated, were low level tracking shots in, over, under and through "Pink's" personal effects, a dead soldier on a battlefield—covered in flies, and some dream-type sequences down endless hotel corridors and empty rooms—all to be shot in miniature with the Cosmoglide.

Alan had seen a fairly complex series of promotional shots we had done the year before. Some of these centered around an "00" gauge model railway and we were using the locomotive as an excuse to do complex camera tracking moves.

One shot starts within a miniature jungle and develops into a tracking shot between two freight trains, at axle level. Up ahead, a small pool of water appears and as the trains circumnavigate this—one to the left, one to the right—the camera dives into the pool and a large leopard frog leaps in and swims past. The camera then emerges (no drips on the part) and continues to fly along with the trains, but now rises as if in a helicopter. In another shot we fly the full length of a tunnel, emerge into brilliant sunlight, go immediately beneath a bridge and suddenly tilt down and back to reveal the complete bridge, the complete tunnel and the train emerging from the tunnel and catching up fast. A third shot causes the train and track to prescribe a complete loop—another shows the train travelling at speed while the camera flies right round the locomotive—all travelling in real time. All shots necessitated two tons of equipment travelling at the same speed as the train. Some shots utilized the Pathfinder—others the Cosmoglide.

The sequence ends as a huge avalanche completely wipes out the train. This we shot mostly at 600-800 fps and all through used wide angle optics to enhance the scale and perspective. ■



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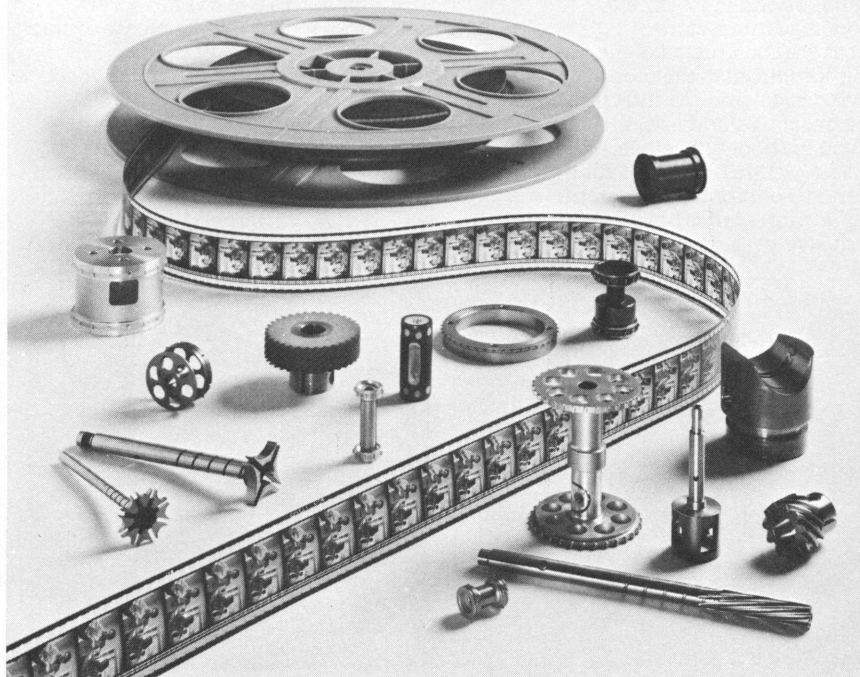
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Notes on THE WALL Continued from page 1024

by the work of production designer Brian Morris and director of photography Peter Biziou. Brian Morris, whose recent credits include QUEST FOR FIRE and YANKS, was originally trained in theater design and worked with the Royal Shakespeare Company. He had previously worked with Parker on a BBC Television film and two short subjects. Peter Biziou has an extensive background in commercials and first worked with Parker on the same two short subjects. BUGSY MALONE was his first feature and his more recent credits include THE LIFE OF BRIAN and TIME BANDITS.

The key to the style for the live action sequences was achieving a degree of surrealism which was compatible with the animated sequences. From the outset Biziou realized he was going to have to create very strong images. "I was going to go for very strong contrast. I would be using, for instance, arcs with clear glass for hard shadows, this kind of thing. I decided to let myself be affected by the mood and words of the Floyd's music and apply as much dramatic effect as possible to Brian's set designs and Alan's ideas. Technically this involved using super speed lenses and keeping the negative as clean as possible (no filtration) because the 35mm squeezed neg was going to 70mm and through opticals. The Samcine Inclining Prism was also invaluable." Much of the film was shot from extreme low angles to contribute towards the surreal effect.

Biziou describes an example of the way in which photography, art direction and animation combined to create a nightmarish effect. "The camera pulls back from a medium closeup of Pink in his armchair to a very wide angle and we discover either the room is very large or he's very small. Then the shadow of his wife appears on the wall. She is walking towards him and growing in size and very smoothly her form becomes Gerald Scarfe's animation which continues growing into a gross figure that is persecuting Pink. Brian Morris had to build a very large room and cheat the perspective. We kept Pink and all the furniture the same normal size so that as the camera pulls back you are given the impression that he's totally alienated in this very, very large room."

For more on the production of the film see Alan Parker's article. ■

Falklands
Continued from page 1008

weeks to get back to the UK and I have reflected since and wondered whether my approach to that job would have changed if I had known that it was going out that night.

The original intention was that we would hang around on Ascencion Island for some time, till the rest of the fleet had gathered, but within 10 hours of us arriving there the decision was made for us to sail to the Falklands and off we went. I suppose the first contact we had with the enemy was the report that there were Argentine submarines in the area. That was never proved, but what was proved some days later was the presence of Argentine reconnaissance aircraft, 707 military aircraft, in the area, and they were tracked on our radar. As soon as they appeared on the radar the Harriers would go up and chase them off but as they were outside the exclusion zone they weren't fired on. We went on down towards the Falklands with a daily visit by these reconnaissance aircraft, which were always being chased away. There were also Russian aircraft in the area. They were reckoned to have come from Angola.

We went on further South and of course it got very much colder, bitterly cold, until we got to the point of the first attack on Port Stanley. The planes took off from *Hermes* at first light and I can tell you now that 12 took off and 12 returned. At that time we couldn't report that 12 returned. Later that day of course we did lose an aircraft from *Hermes*, which was shot down; the pilot was killed. And later that day HMS *Sheffield* was hit.

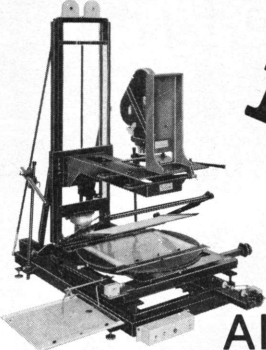
Sheffield was hit by an Exocet missile and caught fire. We could see it from our ship, although it was some considerable way off. All the casualties from *Sheffield* came aboard our ship and were treated in our sick bay. Quite a lot of major surgery was done there. Some of the survivors also came aboard and a lot of our fire fighting equipment was taken by helicopter to the *Sheffield* in the hope that it could put out the fire but it had taken such a hold that it was impossible to deal with that. Of course the Exocet had put their fire fighting equipment out of commission. Their power supply had gone; they had no pumps and no power to drive their pumps. So the thing just burnt itself out. It took some days to do that. After a tremendous battle with the

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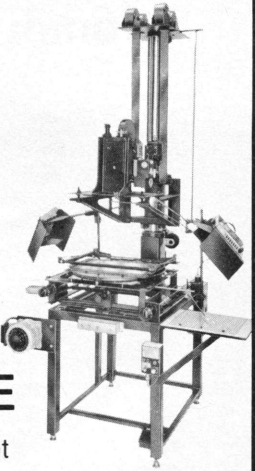
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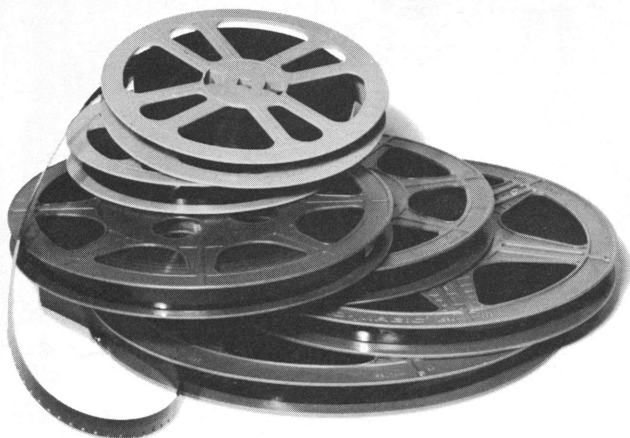
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Minister of Defence man on the ship I flew over the ship three days later when it was still burning and still very much afloat.

We brought back the tape to *Hermes* and the captain of *Sheffield* and his first officer and his engineer in command, spent many, many hours viewing that tape, to assess the damage, to try and decide whether it was worth an effort to save the ship. In fact they did try to save it. They took the ship in tow and tried to take it down to South Georgia but on the way down there was another explosion aboard and it sank.

On *Hermes* we had a fair degree of freedom. There were very few places we couldn't go and those places which were restricted, we understood the reasons why. We could do more or less what we liked below decks, we could go down to the engine room, we could go down to almost any part of the ship we wanted to. We had freedom of the flight deck as long as we told the flight control officer. The flight deck was a very very dangerous place to be. When a Harrier takes off you have to wear ear defenders. If you don't, your ear drums will be blown, without any question. Whatever attitude the aircraft is in, if it's about to take off and it's going vertically or a more or less horizontal takeoff, you have to wear ear defenders. And the power from the engine is such that it will bowl you over. So you have to be pretty careful where you're standing and what you're doing. It's very dangerous.

The interesting feature about the whole operation is that without the two carriers, the *Invincible* and the *Hermes*, the operation could not have taken place because they provided the air cover. We only had about 20 fighters to protect the whole Task Force. Some of those fighters came out on the *Atlantic Conveyor* which is an ordinary merchant ship, which overnight had been fitted with a flight deck from which the Harriers could take off. It would have been quite impossible to have this operation without those Harriers. Because how could you transfer them from a ship which has no flight deck to a ship like the *Hermes*, unless you have a plane like the Harrier which has proved itself to be probably the most outstanding aircraft in the world? That's the judgment of the pilot and the naval men who had to make this operation work. A brilliant operation. They were outnumbered five or six to one in terms



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of fighters by the Argentinian air force.

After a week of intensive air raids in San Carlos water, I transferred from *Hermes* to a ship called *Stromness* to go in with the fleet on the first morning. Most of the troops went ashore in the dark and by daylight most were there, and to go on the deck as dawn broke to see something like 30 ships, really an enormous armada, in a beautiful setting, was fantastic. It was a gorgeous morning—crystal clear, beautiful sunlight—but not the weather we wanted. We wanted misty weather in which the Argentine aircraft couldn't fly. It was actually perfect for them, and they took advantage of this. Within a very short time the air raids started and they were almost continuous for seven days, almost round the clock. There was some staggering flying by the Argentinian pilots, very brave men, very good pilots. The accuracy of their bombing was without question. If it hadn't been for the fact that many of their bombs didn't explode—they hit the ships, they went through the ships, they buried themselves in the ships but didn't explode—I think it could have been a very different story. I can't remember the number of ships, it might be seven, eight or nine that might well have gone down in addition to the ones that we did lose. In fact we had only lost at that point one merchant ship, and that was the *Atlantic Conveyor*, which was still out with the main fleet.

When we arrived in San Carlos water, we spent a whole week on two ships, one the *Stromness*, which was the supply ship, albeit armed with 18 machine guns just to protect it against air attacks, and then we spent a few days on *HMS Fearless*, an assault landing craft. Throughout that week there were almost continuous daily air raids during the daylight hours. During that period, of course, a number of ships were hit. On many of them, thank God, the bombs did not explode. They entered the ship, they buried themselves down in the bowels of the ship and many of them were subsequently defused. On one for example, the bomb disposal team had to use acetylene burners to cut out great chunks of deck and bulkheads, lift the bomb out then lower the bomb into a rubber dingy. Rather than just tip the bomb out of the dingy, they deflated it so the bomb was lowered very gently into the water.

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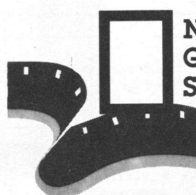
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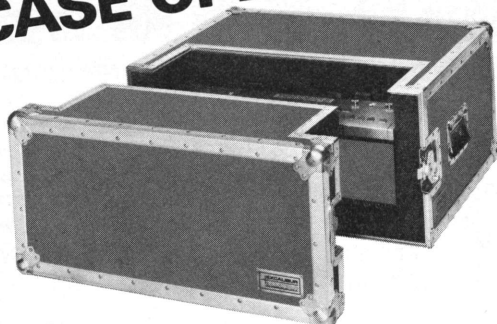
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In addition to our gear, we carried a minimum change of clothing such as underclothes, shirt and a pair of trousers. That's all, nothing more. You carry your food, you have to carry a supply of food for two days, which in itself is quite heavy, that's about six tins, albeit small tins, but still very heavy, with biscuits, chocolate, all the things that are part of a 24 hour ration, standard for the British Army. You'd carry a mess tin, a little stove onto which you put Hexamin blocks, that's the blocks that are like fire lighters. One of these in normal weather conditions will boil a pint of water but in the mountains of the Falklands they certainly won't boil a pint of water. You probably need two or three if you're lucky. So you carry all of this lot, and batteries. I carried three ENG camera batteries, four video tapes, my bedding roll and all the bits of cable and the accessories. I always carried a small transistor radio so I could keep in touch with the news in London, so that we did have some idea of what's going on in the world. There was no other form of communication. That, with the camera, weighs you down considerably, something like 70 lbs. maybe a bit more than that.

The main problem, apart from the things being heavy, is that you are very very cold all the time, extremely cold. This is very wearing and it makes everything you do that much harder. I think if you stand out on a bleak hillside and the wind is blowing all the time, everything becomes an effort.

In the Falklands there is a constant high wind, bitterly cold, coming straight up from the Antarctic. It did make working very hard. It made hand holding a camera very difficult. Almost impossible to get a nice steady picture even on a wide angle lens the wind was blowing so hard.

Our filming position in San Carlos waters was on the highest point on the deck that we could get to, so that we had an uninterrupted view of the whole of the water and of as many ships as possible. In fact we were probably very vulnerable there but in some ways I felt safer on the top deck than if I was buried down below. I felt that if the worst came to the worst I could jump over the side and if it was cold if I swam hard enough my body temperature might just stay. Although they reckon that if you spend more than two minutes in the waters off the

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Falklands you would die from hyperthermia. You wore your own personal life belt which was round your waist in a pack.

However, on a ship like *Hermes* you carried a gas mask, a life jacket and what they call a 'once only immersion suit,' which is a rubber suit which covers your body completely up to your neck. It keeps the water out and the heat in your body so that if you have to jump into the water, they reckoned that instead of having two minutes or so to live, you'd probably have two hours in which to survive, which normally would be enough time for rescue helicopters to pick you up.

When we went to HMS *Fearless*, which was the last ship we were on before we went ashore, the captain insisted upon us wearing a flack jacket, to protect us against shrapnel, and a steel helmet. And, of course during air raids we also had to wear anti-flash gear, the white mask that covers all your face, except your eyes, and wear white gloves as protection against fire. So all in all you were very much encumbered in the process of trying to do your job. It was necessary for your own protection.

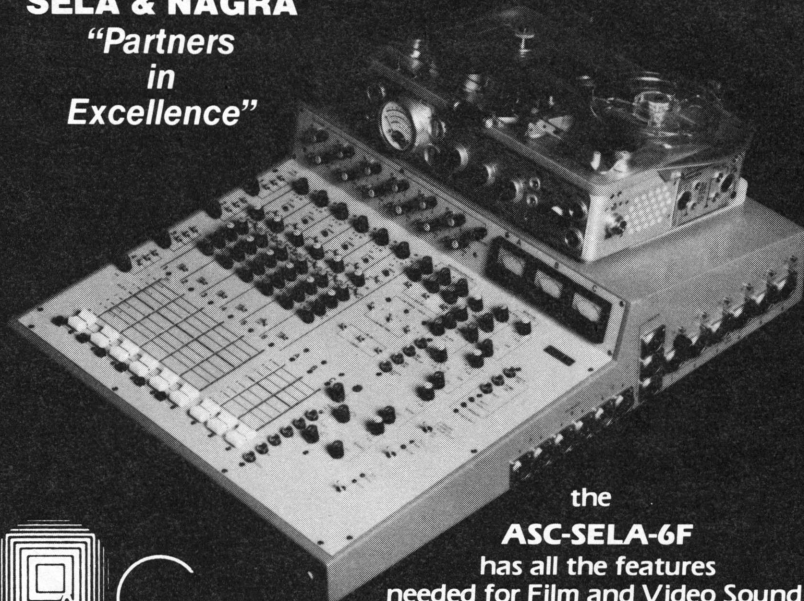
We went ashore initially with the 5 Brigade and went to San Carlos Settlement with 5 Brigade, the Gurkhas and the Welsh Guards. We spent some time there. We actually slept in a sheep shed. We stayed for a couple of days and then moved on. We went by foot some of the way and then were taken in the only Chinook twin-rotor helicopter that the services had at that time with a company of Gurkhas to Darwin, near Goose Green, to what was to be the Battalion headquarters. There we stayed for a few days until we moved on to Fitzroy in a ship called the *Monsoon*, which is a little old island tug put back into commission by the Royal Navy after it had been partly damaged by the Argentinians. It had a Royal Naval crew on board along with one or two Falkland Islanders. Again we travelled with the Gurkhas and a detachment of Brigade signals, something like 200 men and their gear and some vehicles from Goose Green to Fitzroy, which was almost on the front line position. And it was there, of course, in the waters just around Fitzroy, that *Sir Gallahad* and *Sir Tristram* were hit by the last Argentine bombing raid. I suppose that was the biggest loss in the whole war.

Until about the second day in San Carlos waters we hadn't seen the ITN

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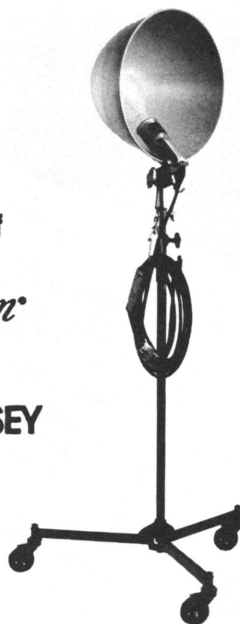
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crew at all. They went ashore on the first day with one of the marine units into San Carlos and they had the misfortune of having electronic trouble with their ENG camera. They made their way back to the ship where we were to see if we could help them. Well the only way we could help them was to give them one of our cameras. We had one film camera and one ENG camera and I had to make the decision then which one I would want to keep for my own use. I decided it was right for me to have the ENG camera so I gave them my film camera, which fortunately helped them out of a spot. I think if I hadn't been faced with that particular problem at that time I would have gone for an ENG camera anyway, because I think it would have been the right camera to use in all circumstances.

It would be possible for me to get sufficient battery power to keep going for three days under normal circumstances and it would be possible to get a helicopter lift back to either the brigade or the battalion headquarters, where I knew we could get power supply to recharge batteries. So in the circumstance ENG seemed the right thing. If there had been a danger of not being able to get batteries charged, then I think I would have plumbed for the film camera because we could have recharged our CP16 batteries on a motor car 12-volt battery, so that would have been no problem.

One afternoon, beautiful and sunny, about two days before the final assault on the mountains just outside Port Stanley, the 2 Para Regiment was on rest and I thought I would take the opportunity of seeing the soldiers relaxing. I hadn't seen them relaxing before. For example some of them were fishing from the jetty at Fitzroy. I also wanted to show something of Fitzroy settlement. So I decided to go up over the hill, on the other side of the jetty, which in fact overlooked the water alongside Fitzroy. While I was moving up there we suddenly heard the Argentine fighters coming in and I saw one flash by us. I switched the camera on immediately but with the ENG it takes some 6 or 7 seconds before the camera is operational. I certainly saw four aircraft, only two of which I was able to record. We were very close to the top of the hill and only had to move a matter of 10 or 20 yards and there in front of us was a great pall of smoke, pouring from the stern of the *Sir Galahad*, which had

been hit, and it was quite obvious from the way men were running around that they were in desperate trouble. I suppose there I witnessed the bravest acts of the war, where men took enormous risks, particularly the helicopter pilots, in going in so close. I should think their rotors must have been inches from the ship's super-structure in their endeavours to rescue the men who had jumped into the water. In fact they were flying in thick black smoke. We couldn't see the helicopter, all we could see were the men in their once-only suits, being pulled out of the water by the helicopter. Then they would emerge from the smoke and bring the casualties over onto the ground close to us. Many of them were stretcher cases, many of them had limbs missing, many were badly burnt, and what was so impressive was the speed and the efficiency of soldiers on the ground and the way they helped their injured colleagues. They seemed to be most professional in everything they did.

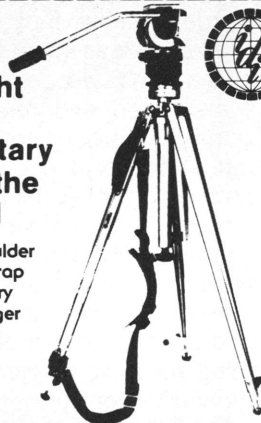
Many of the survivors jumped in the water. They were rescued by boat and the boat would row ashore. Many of these men were also injured and many of the rescuers walked down into the bitterly cold water in order to help their wounded colleagues. I was very privileged to witness such considerable acts of bravery.

The war ended for me while we were up on the Two Sisters mountains, with the Gurkhas. We had spent two very bitter nights up there. It was so extremely cold that my water bottle was frozen solid in the morning because I had forgotten to put it into my trench. You have to dig your own trench every time in order to protect yourself, not really from the weather but from Argentinian shelling, and we had been shelled quite considerably that day. When I went to bed at night I wore two pairs of trousers, two vests, one an arctic vest, a shirt, two sweaters and two anoraks and two big pairs of wooly socks. That's how I got into my sleeping bag at night, and I was still cold. It snowed most of the night. Fortunately it was a very cold and dry snow, so I didn't get very wet. Getting up in the morning was always the hard job. Your bones were so cold and it was so difficult to find the energy; you had a fair amount of mental effort just to get yourself moving.

It was that day that, after two or three hours of very heavy shelling, and our troops moving forward to-

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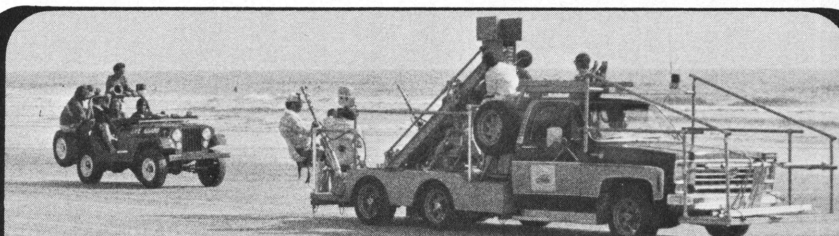
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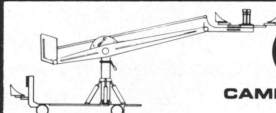
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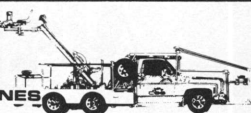


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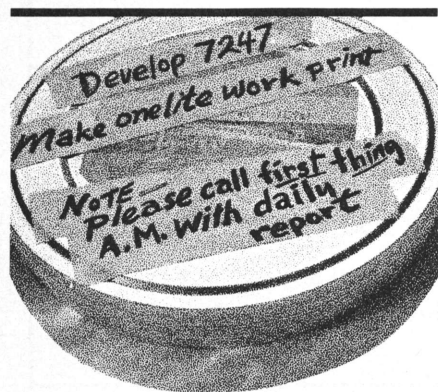
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wards Stanley that the white flag went up. It was generally totally unexpected and we were so elated. It transformed everybody from being rather depressed, not at the fighting, but at the cold and the uncomfortableness of everything. Everybody's attitude changed. We had a sort of contentment that we hadn't experienced for many, many days.

When we were told the white flag had gone up we realized that the only thing we could do was to get a move on and to get down into the town so that we could cover the troops going in. Then we were told that in no way would we be allowed to do this because the area immediately in front of us was mined and we had seen casualties coming back from that area, men who had had their legs or their feet blown off, and if you get advice like that you take it. So the only thing we could do was to try to get a helicopter to take us back to Brigade Headquarters and to get a helicopter from there to Port Stanley when it was safe to do so. Eventually we did get a helicopter. Five of us, plus the pilot and the co-pilot climbed into a small Scout helicopter which was designed to carry only four people. Not only did it have seven people on board, it had all our equipment and all our personal baggage. I was standing on the skids of the helicopter for the whole journey back to Fitzroy, along with the co-pilot. And that's how we travelled.

In some ways the whole campaign was reminiscent of the First World War. The mud and the dirt and the conditions generally reminded me of the pictures I saw of the battlefronts in the 1914-1918 war. And in many other respects certainly like that last war. I think the ground battle was much nearer to the conventional war but the sea war was very different because only missiles were used.

I am often asked: 'How can you stand there and take pictures when there are people injured all around you?' Now I can only do my job properly if the people who are on the ground, if the soldiers around, are doing their job properly and helping their colleagues. I think I said I was so impressed with the way they were doing that. Anything I could do would only be to jeopardize that and put at risk their operation. So far better that I get on and do my job well and let them get on and do their job. Obviously if some of those casualties came ashore and there was nobody



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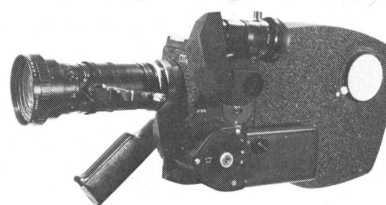
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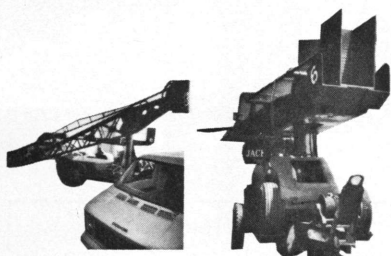
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there to help them, my first priority would be to help them and my job would take second place.

My reporter, Brian Haurahan, and I worked entirely as a team. We had to. We discussed the coverage as best we could because it's very difficult to predict what's going to happen in the course of the day. Sometimes he was not even there with me when I was filming because on some occasions he also had to work as a radio reporter. He didn't go out as a radio reporter, he went out as a television reporter, but because there was no radio reporter with 5 Brigade those duties fell on him. So he used to go away sometimes for two or three days to file stories. He had to go back to a ship that had a satellite communication, which was needed to get his dispatches back to Britain. But we did work very closely together and I think he did quite a magnificent job. A very fair, very honest, very accurate piece of reporting, right from the very start. An outstanding job.

There was only one censor cut of my material. At my end anyway. There were some censor cuts made back in London but I didn't know about that because I wasn't there. When I did eventually get permission to cover the HMS *Sheffield* burning I was given permission on condition that I handed the video tape over to the MOD man on board HMS *Hermes*. It seemed the only way I was going to get that coverage and it was vital coverage. And I acceded to his demands—I had no alternative. I gather that when that material got back to London, which was at the same time as the other material relating to HMS *Sheffield*, there was a delay of something like 48 hours before the MOD releasing it. There seemed to be no reason for it but I think that's how it worked out. It may only have been 24 hours.

The other time that they imposed the same sort of restriction on us was when we did a long interview with one of the bomb disposal teams because they didn't want the Argentinians to know about the methods that we used to defuse them and the fact that their bombs were not exploding, because if they did know that they could make the necessary adjustments to ensure that they did explode. So I think that in those circumstances it was right that they should put an embargo on this material. It has been made available to us since. They were the only areas of video or film censorship.

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office to shoulder blame. The real genius behind Columbia was Sam Bris-kin, a rather cold, gray man with an IBM calculator in his head."

Directing, in Brown's opinion, was as unpleasant a task as ever. "I loathed it—it's the worst job in the world. You're on the set with all those people before and behind the camera, and you have to tell them what to do and they don't want to do it. The front office is always yelling, 'why didn't you do this?' and 'why didn't you do that?' Some masochists love it, or claim to. Like the soap opera people, they're born to suffer. They not only get all the blame if it's bad, but if it's good all the credit goes to the name players. No-body thinks anybody had to direct Valentino or Gable or Presley or even Groucho Marx's wisecracks."

He returned to cinematography and special effects a short time later at RKO-Radio, when producer Bertram Millhauser hired him to work with directors Harry Hoyt and Willis O'Brien on an epic production, CREATION.

"For some sequences I worked out a system of double exposing that worked okay," Brown recalls. "Most of this work was done entirely under water, in a five-foot glass cube built for the system. For a storm at sea I poured in carbon tetrachloride, which created ripples, waves and so on. We had to show a mountain rising from the sea, along with lava, steam and explosions. The mountain was built in sections and the stream was canned milk. When a twister was supposed to come along and destroy everything, we used a canoe paddle to create a vortex in the water and poured Negrosin—a black powdered dye soluble only in alcohol—down the funnel. We couldn't make it come forward toward the camera, so we moved the camera up to it and got the same thing. Our twister even got the effect of turbulence kicking up around the base, which is present in real tornadoes. Some effects men from Paramount came in and watched us and tried to do the same thing, but they couldn't make it work because of all the ripples at the top of the water. I had laid a sheet of cellophane across the top and they didn't know that."

Although the catastrophe scenes of CREATION apparently have been lost, a short reel of footage utilizing animated model dinosaurs does exist—and is excellent. O'Brien animated the animals one frame at a time and these were combined with live action by a new method called miniature process projection.

"O'Bie was left handed and worked quickly. It was a hell of a thing to watch him work with those little animals—a mother triceratops and two babies. The little ones were only about five inches long." A live ape, a jaguar, a kinkajou and a man were placed into the scenes by the new technique.

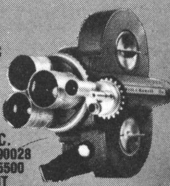
"The picture was halted because we ran into a stockholder's revolt," Brown recalls. "They decided that if it cost about \$300,000 before production even started, how much would it cost to finish?" (It should be noted that a major "A" production in 1930 generally cost less than \$300,000 to produce).

Cinematographer jobs were scarce during the depression years and, after an altercation with a union official, Brown decided to stick with writing and directing. "After that I never shot anything even with a Brownie Kodak. I was through with light-sensitive anything. I like writing—it's one of the few high-paying jobs that is a sitting down job. I'd do my writing when in an

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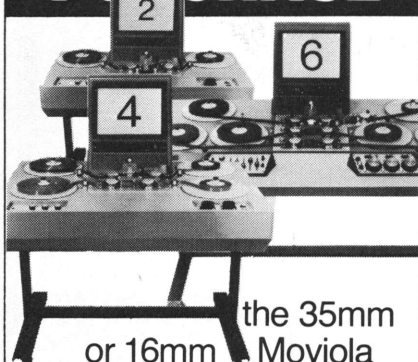
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inspirational period, and do the editing when I was down in the dumps.

"One thing the screen writer has to remember is that the producer is making the picture. The author is only an amanuensis who puts the flesh onto the idea and makes it move."

Brown reluctantly directed a few films in the Thirties, although he preferred working as a free-lance writer. In 1932 he made *FLAMES*, with John Mack Brown and Noel Francis, for the leading Poverty Row company, Monogram. "At Monogram," he says, "a low budget production cost \$10,000 and was shot in a week. A high budget was \$12,000 or even \$14,000 and took a day or two longer."

He returned to writing, first collaborating on the script of MGM's *FAST WORKERS*, a good action-comedy directed by Tod Browning, with John Gilbert and Robert Armstrong.

"The closest you could come to anonymity was to be a staff writer at MGM," he says. "There were 90 of us working there!"

During 1934 he wrote four scripts for another independent company, Chesterfield Motion Pictures, Inc., Monogram's rival, which promised and delivered one feature picture per month.

"Chesterfield's offices were on the top floor of the Guaranty Building at Hollywood and Ivar," Brown recalls. "The writer worked in a small room with two typewriters. Dick Thorpe, the director, was at the other machine. We'd sit back to back, I'd type a few pages of first draft and hand it to him, then he'd write the final draft. We'd do about 30 pages of final script per day and finish an entire script in a week or less.

"That was always the procedure. They allowed one week to write the script, one week to cast, one week to shoot, and one week to edit—a picture a month." The Chesterfield pictures were made on rented stages at Pathé and Universal.

Brown collaborated on the scripts for *THE CALLING OF DAN MATTHEWS* for Sol Lesser-Columbia and *TARZAN ESCAPES* for MGM during 1935. The latter was one of the most expensive pictures of its time, costing more than \$1,750,000. After the preview, it was recalled because of objections from censorship groups that it was too terrifying for family showings. Much of it was rewritten and re-shot, with many hair-raising situations eliminated, final screen credit going to the second producer-director-writing team.

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During the next two years he wrote two screenplays and three originals and directed four pictures, for Grand-National, Republic and Monogram. One of the more interesting gangster pictures of the time was **FEDERAL BULLETS** (1937), which he wrote and directed for Monogram. It was fiction suggested by the career of Mother Mandelbaum, a New York society woman noted for her great contributions to charity. "She actually was a marvelous 'fence,' and nobody would believe she could ever do anything wrong." Former silent picture star Betty Compson was trying for a comeback picture. Brown says, "She looked good but had a voice that would sour milk at 20 paces. Her whining voice was exaggerated by the sound equipment of the time, which was far from perfect."

In 1938 he wrote and directed **PORT OF MISSING GIRLS** for Monogram, which was set in Macao but had to be filmed in the studio. "I wanted to do the real Macao and authentic Chinese bars, but what I really did was present it as I found it in National Geographic. The Geographic may not report all the facts, but what they show is what the public believes. Show the real thing and people won't accept it. They won't believe to this day that Hong Kong is mostly high rise buildings." Brown directed three more Monograms that year and wrote an original for Jackie Cooper, **GANGSTER'S BOY**.

Thoroughly disgusted with directing, Brown decided to work exclusively at writing. From 1939 to 1945 he wrote stories and/or screenplays for 18 features, which were filmed by Columbia (8), Republic (7), Monogram (3) and Ben Judell (1).

The best known of these are three scripts written as Boris Karloff vehicles for Columbia. The first, **THE MAN THEY COULDN'T HANG** (1939), gave Karloff the role of Dr. Savaard, a distinguished surgeon who believes he can revive the dead via a mechanical heart. Police interrupt an experiment and refuse to allow him to revive his student-volunteer. As a result, Karloff is hanged for murder. Brought back to life by an assistant with the mechanical heart, Karloff, now insane, seeks vengeance upon those he feels betrayed him. Shot by the police, he destroys the heart and dies.

This film was so often imitated as to become a cornerstone of the *genre* even though it was filmed in two weeks on a moderate budget. Importantly, it helped give Karloff—who felt he was too old to continue playing monsters—

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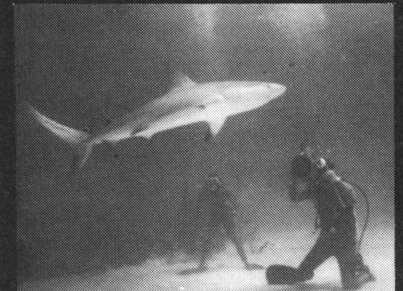
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a new career as an articulate, distinguished character actor. Brown enjoyed writing dialogue for Karloff, who early in the film explains that surgery performed on a living person "is like trying to repair a motor that's still running," and that his invention will "make death our servant instead of our master."

After he has been condemned to die, Karloff requests "the privilege of addressing this court for two minutes. You, who have condemned me, I know you. Your forebears poisoned Socrates, burned Joan of Arc . . . The judgment of history will be against you . . . When your time comes, remember that you killed the one man who could have made your life secure . . . When those you love best lie dying, always remember: you gave death to the man who offered them life." When his daughter tries to reason with him after he has returned, he refuses to give his invention to humanity. "We gave them wings and they rain destruction upon us. We gave them a voice to span the seas and they preach hatred. Even the medicines we gave them to ease their pain have been used to enslave half the world for the benefit of a few. Every gift that science has given them has been turned into an instrument of greed."

In *THE MAN WITH NINE LIVES* (1940), Karloff is Dr. Kravaal, who has even worse difficulties when his experiments in frozen therapy are interfered with. For the benefit of humanity, he uses human experiments, is shot, and dies content in the knowledge that his theories are sound.

"Death becomes our price for living," Dr. Garth (Karloff) says in *BEFORE I HANG* (1940), in which he is an elderly scientist who dedicates his life to developing a serum for the eradication of old age, which he characterizes as a disease. He succeeds in restoring his own youth, but is driven to murder by alien life cells in the serum. Again he is killed, but his words are quoted afterward by another doctor: "In the war of science, many victims must die before the final victory is won."

Brown based the mechanical heart upon the experiments with a similar machine by Dr. Alexis Carrel and Col. Charles Lindbergh, the frozen therapy idea upon actual experiments then being carried out by Dr. Temple Fay and Dr. Lawrence Smith of Philadelphia, and found the more fanciful human cells theory in the writings of Dr. Carrel.

Brown also wrote a great deal of

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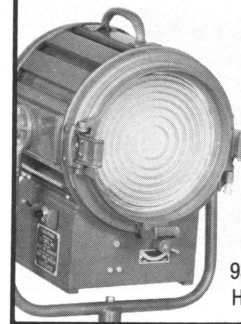
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published fiction, including a novel, *INCORRIGIBLE*, which was "about a young man who believed absolutely in the scriptural admonition to honor thy father and mother. Unfortunately, his father was a crook and his mother was a whore." Brown was paid \$80,000 for the movie rights by producer Herbert I. Leeds. The producer died in 1954 after accumulating high script and pre-production costs and the picture was never made.

Another Brown novel was the basis for Paramount's *THE VANQUISHED* (1953), a Technicolor Western with John Payne and Jan Sterling.

An outstanding book of film history is Brown's *ADVENTURES WITH D. W. GRIFFITH* (Farrar, Strauss and Giroux, 1973), which is noteworthy both for its wit and its wealth of previously untold details of moviemaking in early Hollywood.

Brown is still writing his Hollywood saga. "Each time I finish another chapter or two I send them to Kevin Brownlow, in England. It won't be finished until I am. Kevin keeps track of it all and will put it together after I've gone. I'm the only writer I know who is writing a posthumous book *purposely*." (Brownlow is a well known film historian and documentary producer.)

Strangely, Brown has kept no souvenirs of his career: no scripts, stills, scrapbooks or memorabilia. He has a head full of crystal clear memories, however. He says he isn't interested in the past, only in what is happening today. Fortunately, his current interest is in telling of things that happened in the past, and all lovers of motion pictures will be the happier for it. ■

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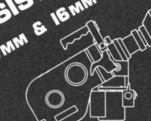
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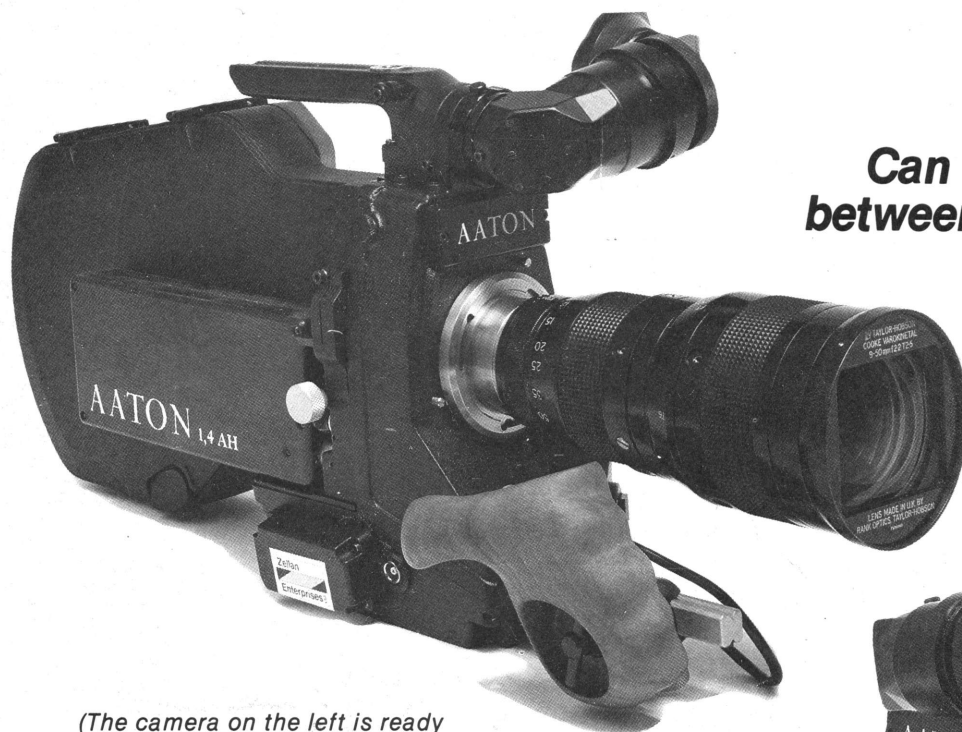
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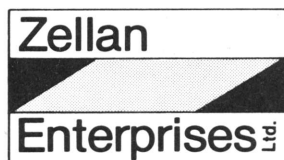
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